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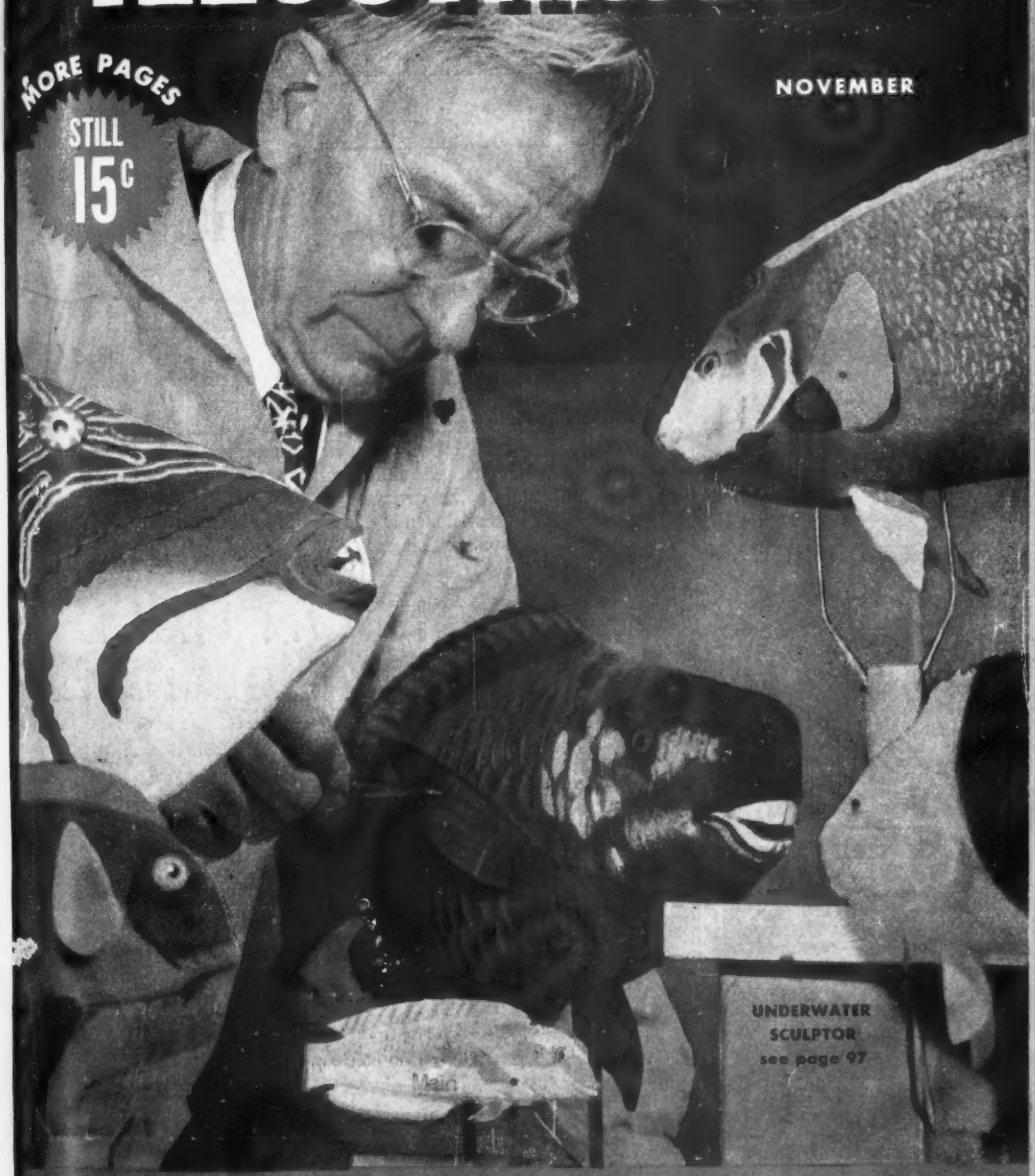

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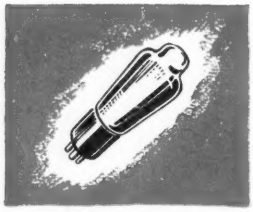

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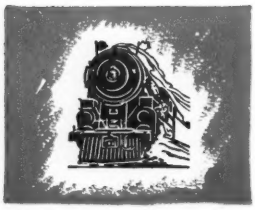

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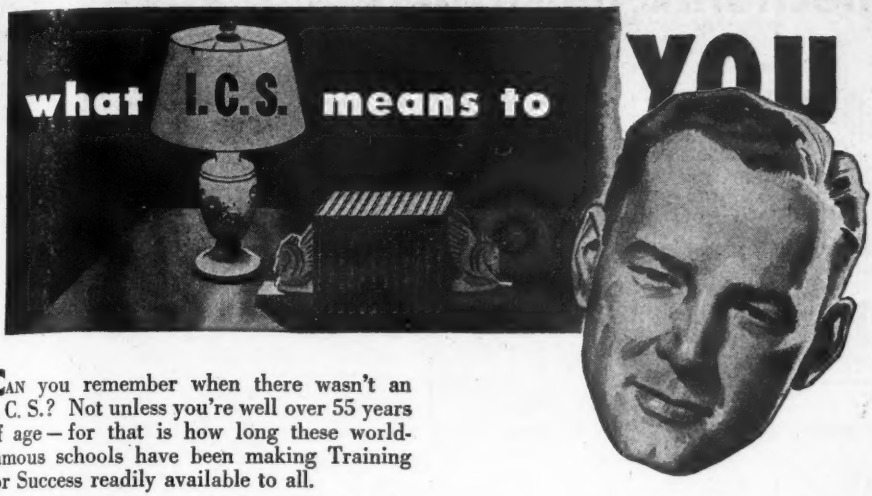

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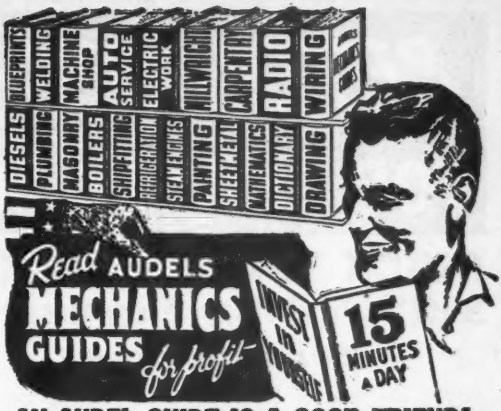

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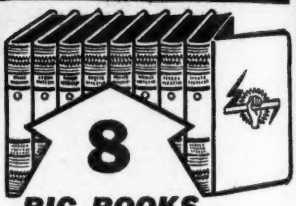

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FREE! EXTRA! If you write us promptly we will include free information about our other big money-making businesses. These include Compo-Tile Roofing and Caen Stone, Plastic Wood, Artificial Marble and Granite, Stone and Metal Solder, Plastic Tile Cement, Papier Mache, and many others.

FREE INFORMATION COUPON!

COMPO-TEX, Box 786-WN, St. Louis, Mo.
Please send me free details of your **BIG THREE** Money-Making Propositions including LIQUID MARBLE. Also include information about the additional new business possibilities given directly above.

Name _____

Street _____

City _____ State _____

A partial view of one of the Training Departments at Coyne

MEN! Whether You're 16 or up to 40.. *Learn* ELECTRICITY

Student Finance Plan

Let me show you how to prepare for a GOOD JOB NOW—Get Ready QUICKLY for the field that offers STEADY WORK and a REAL FUTURE

"LEARN-BY-DOING" IN A FEW WEEKS

Start now to prepare for **a Lifetime of Success.** Get into Electricity, the **essential field** that will continue to offer good pay and **a real future all through the years.** Coyne trains you, NOT by correspondence, but by actual shop work right on real electrical machinery. Then on my "STUDENT FINANCE" PLAN YOU CAN PAY MOST OF YOUR TUITION IN EASY MONTHLY PAYMENTS AFTER YOUR TRAINING PERIOD IS OVER.

In the Big Coyne Shops you get **practical "all-around" training** by actual work—not by correspondence. No advanced education or previous electrical experience needed. Many of my students had no previous experience. **Others had experience in one or two branches but realized they needed all-around training for the better jobs and advancement.**

Earn While Learning

If you are short of money and need part-time work to help pay for your room and board while training, my Employment Department will help you get a part-time job. When you have graduated, they will give you Lifetime Employment Service.

Learn by Doing

You get practical **"Learn-by-Doing"** training . . . wiring, installing, operating, testing, repairing and servicing various types of Electrical and Electronic equipment . . . you work on real armatures, motors, generators, refrigerators, electronic controls, etc.

PREPARE FOR PERMANENT JOBS LIKE THESE
Light and Power Wiring
Power Plant Work
Armature Winding
Substation Operator
Maintenance Electrician
Electrical Testing and Repair
Signal Maintenance
Industrial Electronics
Electric Refrigeration
and many others
Our Employment Bureau for graduates gives FREE lifetime employment service.

Industrial Electronics and Electric Refrigeration Training Now Included

Added training in these two great fields is now included with my Electrical Course. Industrial Electronics and Electric Refrigeration offer big opportunities. Get BOTH at Coyne!

MEN WITH PHYSICAL DISABILITIES—

We also have facilities for men with physical disabilities whether due to war or other causes. Check coupon for particulars if you have a physical disability of any nature.

GET THE FACTS

Don't let lack of money keep you from sending in the Coupon now. My Big FREE Book is full of facts and photographs which tell you about Coyne training. It also gives you the details of my **"Student Finance" Plan, Part Time Employment Plan, Graduate Employment Service, Lifetime Membership, etc.**

MY GRADUATE EMPLOYMENT SERVICE HAS LETTERS FROM DOZENS OF FIRMS ASKING FOR COYNE TRAINED MEN FOR GOOD JOBS WITH A REAL FUTURE.

This modern fireproof building is occupied entirely by the Coyne Electrical School.

VETERANS
Coyne is also equipped to train those who qualify for training under the G. I. Bill of Rights. Check coupon for special G.I. Bulletin

ADDED TRAINING IN INDUSTRIAL ELECTRONICS AND ELECTRIC REFRIGERATION Now Included!

Send Today for this FREE Book!

B. W. COOKE, Director
COYNE ELECTRICAL SCHOOL,
500 S. Paulina St., Dept. 86-53, Chicago 12, Ill.

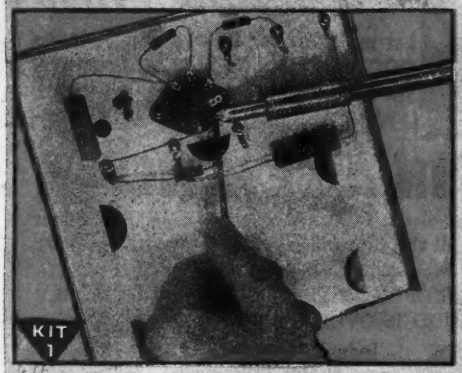
Without obligation send big free illustrated book with facts about Coyne and details of "Student Finance" Plan and added training in Industrial Electronics and Electrical Refrigeration you are now including.

☐ Send special G. I. Bulletin.
☐ Send physical disability details.

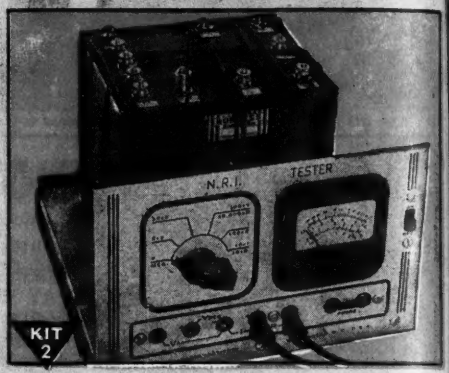
Name.....
Address.....
City.....*State*.....

COYNE B. W. COOKE, Dir. **ELECTRICAL SCHOOL**
500 S. Paulina St., Dept. 86-53, Chicago, 12

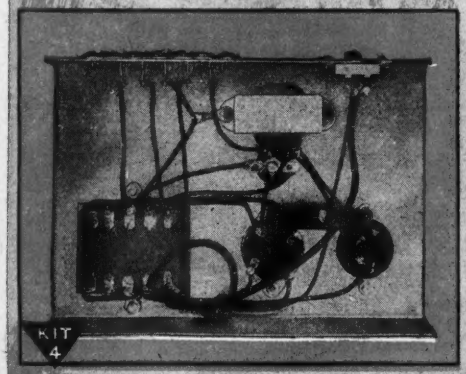
I Will Show You How to Learn RADIO



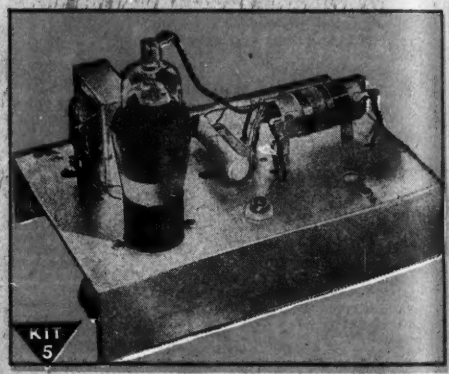
I send you Soldering Equipment and Radio parts; show you how to do Radio soldering; how to mount and connect Radio parts; give you practical experience.



Early in my course I show you how to build this N.R.I. Tester with parts I send. It soon helps you fix neighborhood Radios and earn EXTRA money in spare time.



You get parts to build this Vacuum Tube Power Pack; make changes which give you experience with packs of many kinds; learn to correct power pack troubles.



Building this A. M. Signal Generator gives you more valuable experience. It provides amplitude-modulated signals for many tests and experiments.

MEN I TRAIN AT HOME GET GOOD JOBS LIKE THESE

$50 a Week From Own Shop

"Am making over $50 a week profit from my own shop. Have another N.R.I. graduate working for me. I like to hire N.R.I. men because they know radio."—NORMAN MILLER, Hebron, Neb.

Fixing Radios Profitable Hobby

"I am doing radio work in my spare time, and find it a profitable hobby. My extra earnings run about $10 a week. I certainly am glad I took your N.R.I. course."—FERDINAND ZIRBEL, Chaseley, North Dakota.

Chief Engineer Station KWLM

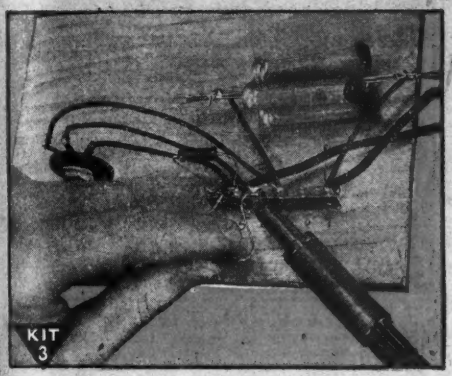
"Am now Chief Engineer of Station KWLM and in charge of maintenance of Police Station KRIN, County Highway Dept. Also have own business."—LLOYD V. STENBERG, 516 Litchfield Ave., W. Willmar, Minn.

Still Climbing in Aircraft Radio

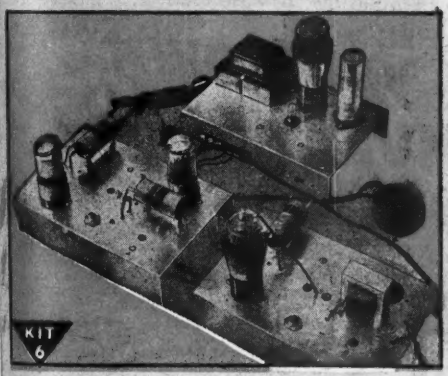
"I am still climbing as a result of my N.R.I. training. I now do aircraft radio work at Greenwood Army Air Field, and operate a radio shop in my spare time."—JAMES L. BOYETTE, Box 218, Greenwood, Miss.

by Practicing in Spare Time

I Send You 6 Big Kits of Radio Parts



You get parts to build Radio Circuits; then test them; see how they work; learn how to design special circuits; how to locate and repair circuit defects.



You build this Superheterodyne Receiver which brings in local and distant stations—and gives you more experience to help you win success in Radio.

SAMPLE LESSON FREE

Gives hints on Receiver Servicing, Locating Defects, Repair of Loudspeaker, I. F. Transformer, Gang Tuner, Condenser, etc. Mail Coupon.

My Radio Course Includes

TELEVISION • ELECTRONICS
FREQUENCY MODULATION

KNOW RADIO *Win Success*

I Will Train You at Home

Do you want a good-pay job in the fast-growing Radio Industry—or your own Radio Shop? Mail the Coupon for a Sample Lesson and my 64-page book—"Win Rich Rewards in Radio," both FREE. See how I will train you at home—how you get practical Radio experience building, testing Radio circuits with 6 BIG KITS OF PARTS I send!

Many Beginners Soon Make Extra Money in Spare Time While Learning

The day you enroll I start sending EXTRA MONEY JOB SHEETS that show how to make EXTRA money fixing neighbors' Radios in spare time while still learning! It's probably easier to get started now than ever before, because the Radio Repair Business is booming. Trained Radio Technicians also find profitable opportunities in Police, Aviation, Marine Radio, Broadcasting, Radio Manufacturing, Public Address work. Think of even *greater* opportunities as Television, FM, and Electronic devices become available to the public! Send for FREE books now!

Find Out What NRI Can Do For You

Mail Coupon for Sample Lesson and my FREE 64-page book. Read the details about my Course; letters from men I trained; see how quickly, easily you can get started. No obligation! Just MAIL COUPON NOW in envelope or paste on penny postal. J. E. SMITH, President, Dept. 6MH, National Radio Institute, *Pioneer Home Study Radio School*, Washington 9, D. C.

Our 32nd Year of Training Men for Success in Radio

MAIL NOW!

MR. J. E. SMITH, President,
Dept. 6MH, National Radio Institute,
Washington 9, D. C.

Mail me FREE, your sample lesson and 64-page book. (No salesman will call. Please write plainly.)

Age.....

Name .....

Address .....

City..... Zone..... State.....

Approved for Training under GI Bill

Do you want

..to go to College?

..or to enter a Profession?

(Such as Accounting, Architecture, Nursing, Dentistry, Teaching, Social Work, Osteopathy, Beauty Culture, Optometry, Embalming, Chiropody, Law, Medicine, etc.)

..or get an Office Position?

To get anywhere, you practically MUST finish High School FIRST. You can complete our simplified High School Course in SPARE time at home, as FAST as your time and abilities permit. Equivalent to resident school work—prepares you for college, pre-professional examinations, business, industry. Standard texts furnished. Diploma. Credit for H.S. subjects already completed. Single subjects if desired. Low tuition, easy terms. American School, Chicago, est. 1897—endorsed by educators. Finish your high school education NOW. Write TODAY!

High School Course at Home

Many Finish in 2 Years

American School, Dept. H-828, Drexel Ave. at 58th St., Chicago 37, Ill

Gentlemen: Send me FREE information covering special training in subjects checked below. No obligation on my part.

- ☐ High School Course
- ☐ Electronics, Industrial
- ☐ Architecture and Building
- ☐ Automotive Engineering
- ☐ Business Management
- ☐ Electrical Engineering
- ☐ Elec. and Gas Refrigeration
- ☐ Air Conditioning
- ☐ Railway Training
- ☐ Diesel Engineering
- ☐ Drafting and Design for Men and Women
- ☐ Plastics
- ☐ Private Secretary
- ☐ Mechanical Engineering
- ☐ Aviation ☐ Radio
- ☐ Salesmanship

Name .....

Address .....

Learn this Profitable Profession

IN 90 DAYS AT HOME

Money-Making Career Open to Men and Women, 18 to 50

Hundreds of men and women between 18 and 50 make $10 to $20 in a single day giving scientific Swedish Massage and Hydro-Therapy treatments. There is big demand from doctors, hospitals, sanitoriums and clubs. Graduates earn large full time incomes from these or in private practice in their own offices. Others make good money from home treatments given in spare time. Learn this interesting, money-making profession in your own home, through our home study course. Same instructors as in our **nationally known** resident school. You can win independence and prepare for future security by qualifying for your Diploma. Course can be completed in 3 to 4 months. Many earn while they learn. Begin your training at once.

Anatomy Charts & Booklet FREE

Enroll now and we will include, at no extra cost, many needed supplies. Fit yourself to help meet growing demand for Scientific Swedish Massage. **Send the coupon at once for complete details, Anatomy Charts and 32-Page Illustrated Booklet, FREE, postpaid.**

THE COLLEGE OF SWEDISH MASSAGE
Dept. 658P, 100 East Ohio St., Chicago 11, Illinois

Please send me FREE and postpaid, Anatomy Charts, 32-page Booklet and complete details on Home Training.

Name.....

Address.....

City.....State.....

IT'S FUN! BE YOUR OWN MUSIC TEACHER!

YES, it's a great pastime learning music this short-cut, Print and Picture way, right at home. You learn to play by playing real tunes by note with the very first lesson.

No boresome exercises. No lengthy, baffling explanations. Instead of hard work, learning to play becomes a genuine pleasure. You start with simple melodies. As you improve, you take up more difficult pieces. And soon you're amazed to find that you can pick up many popular tunes and play them right off.

And that's not all. You can take up any instrument this easy, home-study way for only 7c a day. That covers everything, valuable sheet music, printed instructions, diagrams, and our Personal Advisory Service.

If interested, send for our Free Booklet and Print and Picture Sample which explain all. U. S. School of Music, 9711 Brunswick Bldg., New York 10, N. Y.

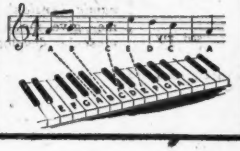
*Actual name on request. Picture by professional model.

PLAYS ON RADIO . . .

"As a proud student I can't keep from telling you that as a result of my course I have a good position playing from KTHS every morning."

*J. S. Heavener, Okla.

It's easy as A-B-C!
Yet it's from that stirring favorite of the South, "Dixie"



Diagrams like this explain everything

Follow the dotted lines from the notes to the piano keyboard and before you know it you're playing the famous "Dixie."

FREE! *Print and Picture Sample*

U. S. School of Music, 9711 Brunswick Bldg., N. Y. 10, N. Y.
I am interested in music study, particularly in the instrument indicated below. Please send me your free booklet "How to Learn Music at Home" and your Print and Picture Sample. (Do you have instrument?.....)

Piano	Piano Accordion	Reed Organ	Clarinet
Guitar	Saxophone	Tenor Banjo	Trombone
Violin	Trumpet, Cornet	Ukulele	Other Instruments

Name .....
PLEASE PRINT
Street .....
City..... State.....
☐ Check here if under 16 years of age.

SAVE 2c—Stick coupon on penny postcard

HOW JUST TWO WORDS TURNED MAC INTO A HE-MAN!

Charles Atlas

—actual photo of Charles Atlas, winner and holder of the title, "The World's Most Perfectly Developed Man."

I Can Make YOU a New Man, Too —in Only 15 Minutes a Day!

If you (like Mac) are fed up with being "pushed around"—if you're sick and tired of having the kind of a body that people PITY instead of ADMIRE—then give me just 15 minutes a day! That's all I need to PROVE I can make you a NEW MAN!

I know what I'm talking about. I was once a thin, pepless, 97-pound "bag of bones" myself. Then I discovered my now-famous secret, *"Dynamic Tension."* It turned me into "The World's Most Perfectly Developed Man." And I have used this secret to rebuild thousands of other scrawny, half-alive weaklings into perfect, red-blooded specimens of real HE-MANHOOD. Let me prove that I can do the same for YOU!

"Dynamic Tension" Does It!

Using *"Dynamic Tension"* only 15 minutes a day, in the privacy of your own room, you quickly begin to put on muscle, increase your chest measurements, broaden your back, fill out your arms and legs. This easy, NATURAL method will make you a finer specimen of REAL MANHOOD than you ever dreamed you could be!

I don't care how old or young you are, or how ashamed of your present physical condition you may be. If you can simply raise your arm and flex it I can add SOLID MUSCLE to your biceps—yes, on each arm—in double-quick time!

FREE BOOK

Thousands of fellows have used my marvelous system. Read what they say—see how they look before and after—in my book, "Everlasting Health and Strength."

Send NOW for this book—FREE. It tells all about *"Dynamic Tension."* Shows you actual photos of men I've turned from puny weaklings into Atlas Champions. It tells how I can do the same for YOU. Don't put it off! Address me personally. Charles Atlas, Dept. 6L, 115 East 23rd Street, New York 10, N. Y.

CHARLES ATLAS, Dept. 6L
115 E. 23rd Street, New York 10, N. Y.

I want the proof that your system of *"Dynamic Tension"* will help make a New Man of me—give me a healthy, husky body and big muscular development. Send me your free book, "Everlasting Health and Strength."

Name .....
(Please print or write plainly)

Address .....

City ..... State .....

☐ Check here if under 16 for Booklet A.

BE A CLERK *all my life?* NOT ME!!

Of course you say you won't.

But you may be unless you do something about it.

Hoping and wishing won't get you a better job and more money.

You must prepare for that step ahead—be ready to make promotion come.

We have helped thousands of ambitious men and women get ahead in the business world—perhaps we can help you.

At least you should investigate. It may be the turning point in your life to a better job and more money. So send the coupon without delay. Check the field of your choice and we'll send you without obligation the requirements and opportunities in that field.

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A Correspondence Institution

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- ☐ Law: LL.B degree
- ☐ Salesmanship
- ☐ Stenotypy (Machine Shorthand)
- ☐ Business English
- ☐ Effective Speaking
- ☐ Industrial Management
- ☐ Executive Management
- ☐ Traffic Management
- ☐ Foremanship

*Name*_____ *Age*_____

*Position*_____

*Address*_____

*City*_____ *Zone*____ *State*_____

No Waiting to LEARN

START NOW TO EARN!

This BIG BOOK SHOWS HOW

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Never before has a more helpful book been printed for those planning a business of their own. Gathered in this large illustrated volume are the formulas, recipes, facts and secrets that have contributed so largely to America's great industrial progress. Capitalize on this information for making most any conceivable product without experience, special equipment or previous knowledge of chemistry. Start at home, expand with profits—build for a profitable independence.

The experts who compiled this book are authorities, and present this information in simple, understandable language. They also give you wholesale supply sources for needed materials, short cuts and economy methods for the most profitable results. Hundreds of good paying businesses have been built on a product made from a simple recipe. Opportunities in this field exist everywhere. Choose from any of the 162,000 facts and 10,000 formulas of which the following are only a very few: Adhesives, Alloys, Anti-Freeze Solutions, Cosmetics, Beverages and Liquors, Candy, Gum, Casein, Celluloid, Ceramics, Cheese, Cleaning Preparations, Concrete, Copper, Cotton, Dentifrices, Depilatories, Dyes, Embalming Fluids, Enameling, Glass, Glazes, Household Formulas, Inks, Insecticides, Iron, Jewelers' Formulas, Lacquers, Laundry Preparations, Leather, Linoleum, Lubricants, Manicure Preparations, Marble (artificial), Metals, Mirrors, Oils and Ointments, Paints, Paper, Perfumes, Photography, Polishes, Powders, Remedies for Man, Beast or Fowl, Rubber Products, Refrigerants, Soaps, Solder and Soldering, Tooth Cements, Transfers, Transparencies, Varnishes and Thousands of others for making all sorts of profitable and practical things.

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This comprehensive book is an accepted authority by chemists, schools, industry, etc. and is the largest and most comprehensive book of its kind ever issued. Nothing else like it in existence. A single formula has been worth a thousand times this book's small cost to countless owners. Crammed with money-making ideas. Invaluable for reference. Ideal for Factory, Home, Farm, Office or Workshop. As necessary as the dictionary and more useful for manufacturers, chemists and salesmen who put up products for profit.

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The Steady Pay Profession *Good Times or Bad!*

SCIENTIFIC CRIME DETECTION

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It Is Easy to Learn!

I will teach you this fascinating science during your *spare time at home.* It pays to be an expert in Finger Printing, Firearms Identification, Police Photography and Secret Service Methods. I have trained hundreds of men and women now successfully serving in identification bureaus throughout America. You, too, may quickly prepare yourself to become a well-paid valued officer of the law, often sharing in the generous rewards offered for wanted criminals.

FREE! "BLUE BOOK OF CRIME"

This book is full of exciting information on scientific crimedetection. It willshow how *You* can get started in a grand career. *Now,* at amazingly low cost. Clip couponNow...Mail ittoday.

53 PER CENT

of all Identification Bureaus in the U. S. employ students and graduates af I. A. S. A majority of these men are heads of Bureaus. Many of them knew nothing about crime detection before training with me. Now they have steady jobs, good salaries and a fine future. Write today for full particulars and free book. Give age.

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Gentlemen: Without any obligation on my part, send me the "Blue Book of Crime," and complete list of Identification Bureaus employing your students or graduates, together with your low prices and Easy Terms Offer. (Literature will be sent ONLY to persons stating their age.)

Name_____

Address_____

_____ Age_____

WHICH OF THESE *Opportunities* INTERESTS *You* MOST?

Accounting & C. P. A.
Air Conditioning
Architecture & Building
Automotive Engineering
Aviation—Practical
Aviation Drafting & Design
Better Foremanship
Bookkeeping
Business Management
Contracting
Diesel Engineering
Drafting & Design
Electrical Engineering
Electricity—Practical
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Mechanical Engineering
Plastics Engineering
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Private Secretary
Radio Operating & Servicing
Railway Training
Refrigeration
Sheet Metal Pattern Drafting
Shop Management
Tool Making

THINK! LOOK FORWARD!

Business is making big, new plans
Men and Women are preparing for the future
WHAT ARE YOU DOING ABOUT *YOUR* TOMORROWS?

Today, choose the job you want—and prepare for it. Or if you are already engaged in the work you like best, start training *now* for quicker promotion. Acquire the knowledge that will help you to get ahead faster, make more money and have greater security.

Invest part of your spare time in more rapid progress. Start training now, in spare time in your own home. Be ready to grasp your opportunity and step out ahead of those who lack the ability you have attained.

American School, founded in 1897 as an educational institution *not for profit,* can help you to reach your goal just as it has helped others during the past forty-nine years. Give serious thought to the list above. Pick one or more subjects that interest you. Then check the coupon at right, add your name and address and mail it at once. The school will send you details on its training plan and outline of study prepared by specialists. There is no charge, no obligation, so send the coupon immediately.

AMERICAN SCHOOL

Dept. G-828, Drexel at 58th Street, Chicago 37

PRACTICAL, EFFECTIVE HOME-STUDY TRAINING SINCE 1897

Take This First Easy Step

CHECK, CLIP AND MAIL COUPON NOW

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Without obligation, Please send FREE and postpaid, bulletin and details of the Subjects checked.

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- ☐ Refrigeration
- ☐ Architecture and Building
- ☐ Contracting
- ☐ Practical Plumbing
- ☐ Automotive Engr.
- ☐ Aviation Drafting
- ☐ Aviation
- ☐ Business Mgnment
- ☐ Railway Training
- ☐ Accounting and C.P.A.
- ☐ Electrical Engr.
- ☐ Electricity—Pract.
- ☐ Electronics, Industrial
- ☐ Bookkeeping
- ☐ Private Secretary
- ☐ Diesel Engineering
- ☐ Sheet Metal Pattern Drafting
- ☐ Drafting and Design for Men and Women
- ☐ Radio
- ☐ High School
- ☐ Air Conditioning
- ☐ Mechanical Eng.
- ☐ Shop Management
- ☐ Tool Making
- ☐ Better Foremanship
- ☐ Machine Shop Operations

Name..... *Occupation*.....
Address..... *Age*.....
City..... *State*.....

National Crafts and Science Show Opens November 17

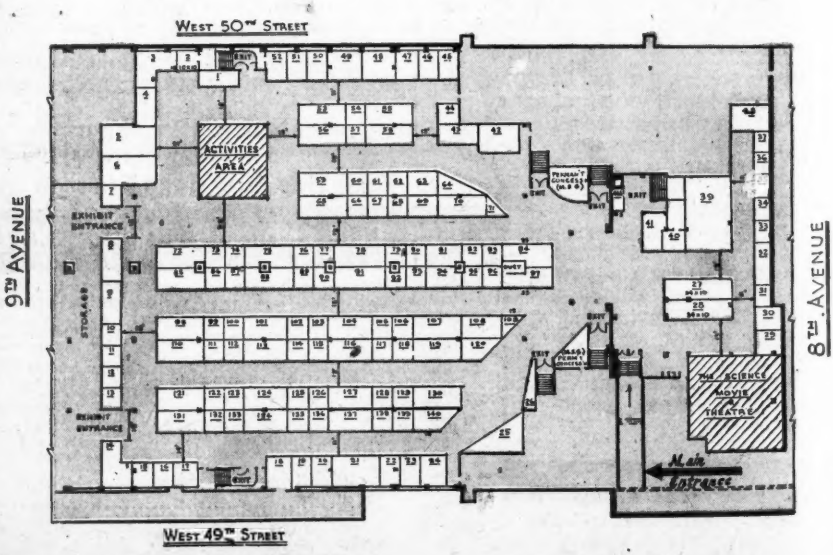
THE big day isn't far off now. Even as you read this, manufacturers from Boston to Los Angeles, and points between, are in the process of crating their exhibits for shipment to Madison Square Garden, New York. They've spent months of planning and many thousands of dollars on dynamic displays that will keep you in the Exposition Hall all day and make you come back for a second look. From all indications the MECHANIX ILLUSTRATED National Crafts and Science Show promises to be one of the outstanding events of the year at the famous Garden.

The affair opens on Sunday, November 17, and runs through until the following Sunday, November 24. This is a fine time of the year in New York, we know that you'll enjoy every minute of your visit.

The diagram below shows the arrangement of the booths in the Garden. As this section of MI was made up almost three months in advance of the show opening, we can't run a complete list of the exhibitors, but even the following preliminary list will give an idea of the great variety of products that you will see:

No.
1—Berkeley Models, Inc., 230 Steuben Street, Brooklyn 5, N. Y.
2—Westchester Hobbies, 259 Mamaroneck Avenue, White Plains, N. Y.
3—Davis Aircraft Engineering Co., Lexington 73, Mass.
4—Boyle Midway Inc., 22 E. 40th St., New York, N. Y.
8-13—MECHANIX ILLUSTRATED
16-17—Modern Products Co., 507 5th Ave., New York, N. Y.
25—DeMornay Budd, Inc., 475 Grand Concourse, Bronx, N. Y.
26—Aviation Products Co., 207 East 43rd St., New York, N. Y.
29—Official Films, Inc., New York, N. Y.
32—Arkay Labs, 1570 So. 1st St., Milwaukee, Wis.
42-43-44—Atlas Press Co., Kalamazoo, Michigan
52—Tison Bros., 2226 S. Sepulveda Blvd., Los Angeles, Cal.
56—Micro-bilt Inc., 370 Lexington Ave., New York, N. Y.
57—Consolidated Model Engineering Co., 3087 3rd Ave., Bronx, N. Y.
58—X-Acto Crescent Products Co., 440 Fourth Ave., New York, N. Y.
60—Eagle Model Aircraft Corp., Brooklyn, N. Y.
61—Continental Products Co., 227 West 64th St., New York 23, N. Y.
62—Darra James Corp., 95 North Main St., Waterbury, Conn.
63—So-Lo Works, Inc., Cleveland, Ohio

[*Continued on page* 16]



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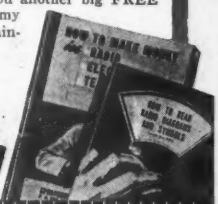

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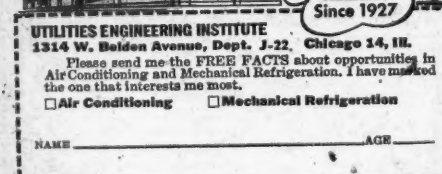

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Editor's Workbench Chips

[*Continued from page 14*]

No.
65—Burgess Battery Co., 198 North Wabash, Chicago, Ill.
72A—Megow Corp., Howard & Oxford Sts., Philadelphia, Pa.
72B—Bantam Products, 51 Chambers St., New York, N. Y.
73—Pacemaker Engines, New York, N. Y.
74—Master Modelcraft Co., 1074 Franklin Ave., New York, N. Y.
75A—Fabricated Products Corp., 30 Main St., East Orange, N. J.
76—Cannon Mfg. Co., 1878 East 18th St., Cleveland 14, Ohio
78B—The AP Parts Corp., Toledo, Ohio
79—Mantua Metal Products Co., Woodbury Heights, N. J.
80—Varney Models, 1239 Fullerton Ave., Chicago 14, Ill.
81—American Handicraft Co., 45 So. Harrison Ave., East Orange, N. J.
82—U. S. Plywood Co., 55 West 44th St., New York 18, N. Y.
83—Albert Constantine & Co., 797 East 135th St., New York, N. Y.
84—Delta Mfg. Co., 600 East Vienna, Milwaukee, Wis.
85—Warner Electric Co., 663 North Wells St., Chicago 10, Ill.
87—Fellowcrafters Inc., 130 Clarendon St., Boston, Mass.
88—Chicago Wheel & Mfg. Co., 1101 W. Monroe St., Chicago, Ill.
93—General Electronics, Inc., 1819 Broadway, New York, N. Y.
94—Logan Engineering Co., 4901 West Laurence Ave., Chicago 30, Ill.
96—Carmen-Bronson, 165 East 3rd, Mt. Vernon, N. Y.
97—Delta Mfg. Co., 600 East Vienna, Milwaukee, Wis.
98—Hobby Book Mart, 150 Nassau St., New York, N. Y.
99—Thompson Engineering Co., Grand Rapids, Mich.
101—South Bend Lathe Works, South Bend, Ind.
102—Hobby Lines Mfg. Co., Scranton, Pa.
104—Wm. K. Walthers, Inc., 241 E. Erie St., Milwaukee, Wis.
105—Topping Models Inc., 106 No. Main St., Akron 8, Ohio
106—DaMyco, 82 Cortlandt St., New York, N. Y.
108-109—Hull Supply Co., 3 Great Jones St., New York 12, N. Y.
110—Hallicrafters Co., 2611 Indiana Ave., Chicago, Ill.
111-112—American Radio Relay League, West Hartford, Conn.
113-114—Universal Handicraft Service, 1267 6th Ave., New York 19, N. Y.
116—Sylvania Electric Products Inc., 500 Fifth Ave., New York 17, N. Y.
118—Benjamin & Medwin, 1150 Broadway, New York, N. Y.
120—Patent Specialties Inc., 4020 10th Ave., New York, N. Y.
123—Raytheon Mfg. Co., Waltham, Mass.
127—Federal Engineering & Mfg. Co., Brooklyn, N. Y.
128-129-130—Eastman Kodak Co., Rochester, N. Y.
136—Pictorial Films, 1270 6th Ave., New York 19, N. Y.
137—Display Lighting, 417 E. 61st St., New York 21, N. Y.
138-139-140—Eastman Kodak Co., Rochester, N. Y.

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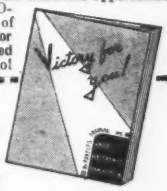

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Mr. Kraus has been giving advice to inventors for more than 20 years. He will attempt to answer as many letters from inventors as possible in his column each month. Mr. Kraus will "call his shots as he sees them" in this column. Thoroughly versed in inventions and inventions procedure, he will never, under any circumstances, disclose any valuable secrets. He cannot answer questions relating to patent law. For such information, the Editors suggest you communicate with any one of the patent attorneys who advertise in MECHANIX ILLUSTRATED.

Fluid Drive

H. M. Shirk, Los Angeles, California, asks several questions concerning a fluid drive mechanism.

ANSWER: *We see nothing wrong with your proposed system of fluid drive modification. It appears that this would offer certain advantages but we are not so sure that these advantages would be offset by the much greater costs of production or the many more points where the mechansim might fail or get out of order. If this should happen, and we don't see how you could avoid it, the repair bill is likely to be rather high.*

It would seem that the same effectiveness could be given by introducing ports instead of the mechanism you recommend Then a single sleeve could be the control. But here again, the idea becomes elaborate instead of simple.

In our opinion, simplification of the entire suggestion is much to be desired.

Gasoline Engine

Joseph F. Hicks, Holt, Alabama, has designed a new type of gasoline engine and wants us to tell of its advantages and disadvantages.

ANSWER: *No doubt that the proper engineering can insure that this gasoline engine will work. But why should anyone want to do so? Much more preparatory work and much extra machining is needed to produce this gasoline engine which, as far as we can see, will offer no advantages whatever over other gasoline engines. When it comes to making repairs on your design you will run into much more trouble than with other modern designs. Our recommendation is that you forget this idea.*

Perpetual Motion

Stanley Kukla, Manderson, Wyoming, wants us to tell him all about perpetual motion and wants to know why many of the perpetual motion machines which have been "invented" never appear on the market.

ANSWER: *Many papers have been presented on this subject and several books have been printed. Many more would be needed to cover all of the designs.*

The answer simply is that no such machine has been invented. There are mechanisms which will operate for as long a time as 2,500 years, for example, the radium clock. Others which will function as long as the parts from which they are made do not wear out. Some of these operate by sun power, others by atmospheric temperature changes, still others by humidity changes or air pressure changes. But, to the best of our knowledge, no machine has ever been developed which depends upon gravity as the force for its movement. By the word "developed" in the previous sentence, we are referring to a complete working mechanism from which all elements of fraud have been eliminated.

Target for Rifle Practice

Joseph McGurrin, Newark, New Jersey, submits a design for a target for use in pistol or rifle practice.

ANSWER: *How far this design will conflict with the mechanism used for throwing "clay pigeons" might be determined from a search. We would recommend that you instruct your patent attorney to have such a search made.*

In our opinion this appears to be a worthwhile idea because of the ready replacement of expensive target materials with inexpensive substitutes. However, much greater danger attends the use of your targets because during the process of recording, it is in the line of fire.

WARNING

Since the article "20-mm. Shell Lighter" appeared in the September MI, we have been informed by the War Department that the method described for removing the powder from the explosive head and taking off the fuse tip is misleading and could lead to serious injury. For safety's sake, then, don't attempt to follow the instructions in the article

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The Rules of Practice of U. S. Patent Office advises—unless the inventor is qualified to handle such matters—that he employ the services of a competent Patent Attorney in the preparation of his Patent Application. We are Registered Patent Attorneys fully qualified to represent you at the Patent Office. Our long and varied experience in patent practice, we believe, enables us readily to understand inventors' disclosures, to advise what is probably patentable, after conducting preliminary patentability investigation of prior U. S. patents, and to draw your specifications and claims in such manner as to present clearly the novel features.

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Remember, the details of your invention do not have to be 100% perfect before you can obtain patent. Unwise inventors often devote considerable unnecessary time working on unimportant details of their devices. This is expensive, hazardous and unnecessary. First step is to have us conduct search for the prior U.S. patents and render a report as to its patentability. Our Search Report is very valuable to you in that it clears up the course you should take in regard to your invention. If our Report is favorable, this report of the patentability of your device shows that your chances of patent protection are in your favor.

Have Patent Protection First

Unless you safeguard your invention by obtaining a patent, thereby securing a monopoly on same, it may become "public property," free to be made, used and sold by anyone, or it may be patented by some other person.

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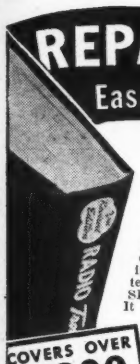

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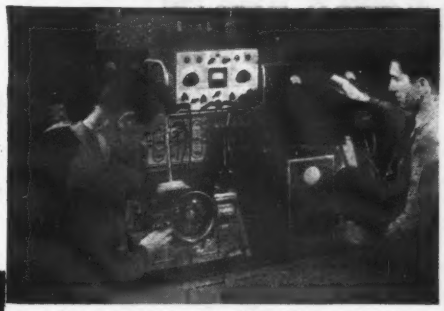

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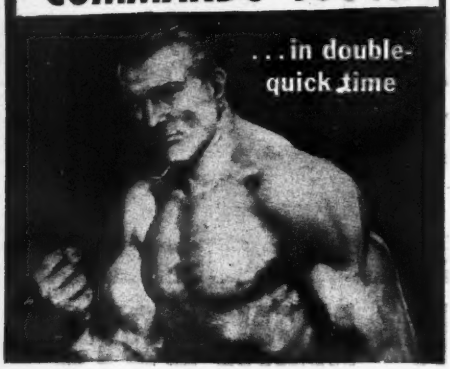

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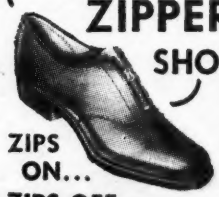

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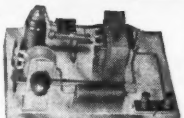

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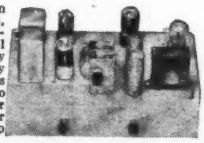

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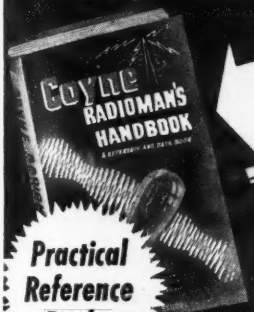

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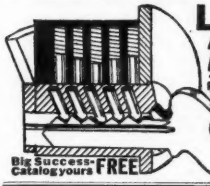

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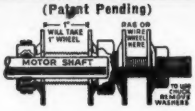

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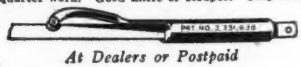

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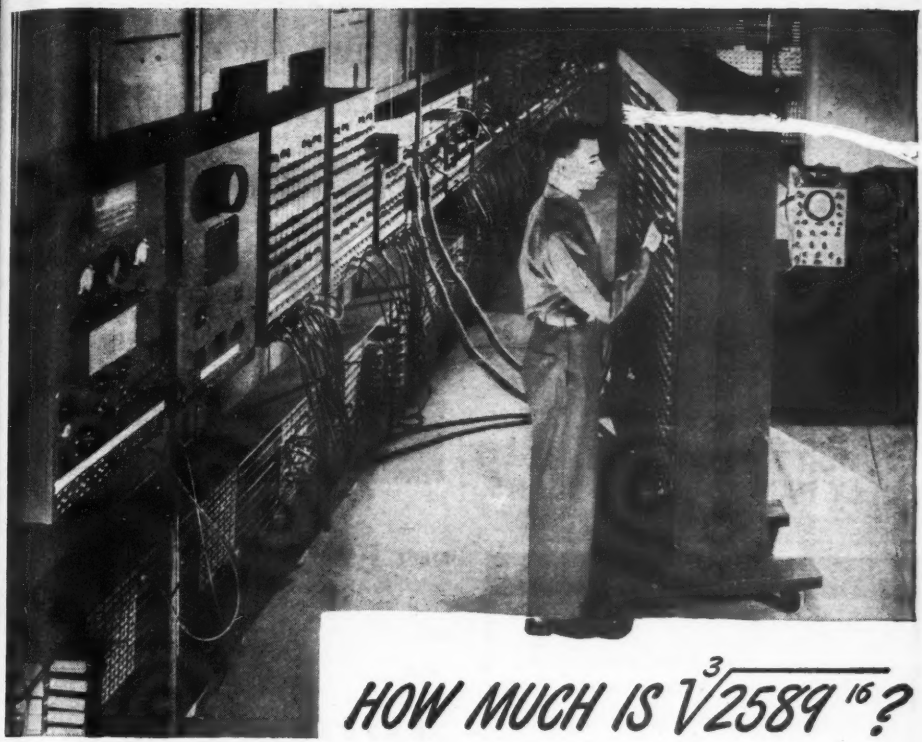

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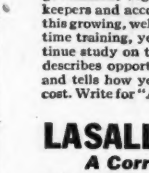

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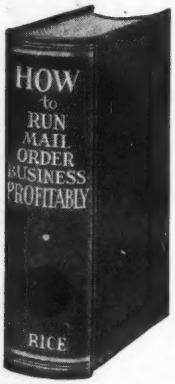

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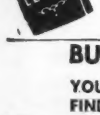

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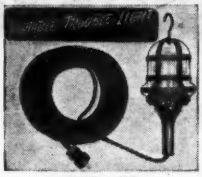

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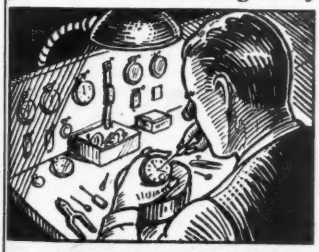

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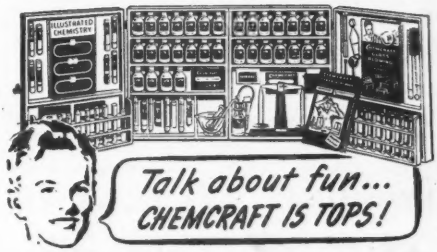

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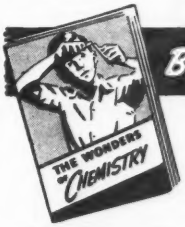

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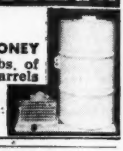

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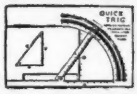

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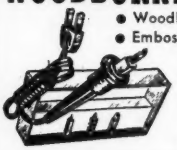

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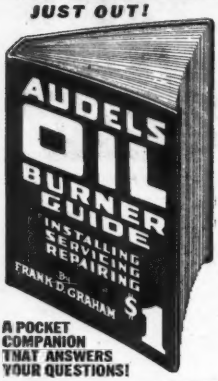

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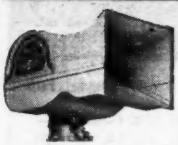

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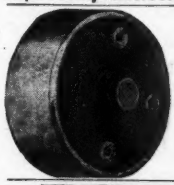

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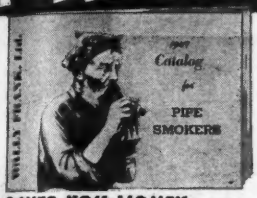

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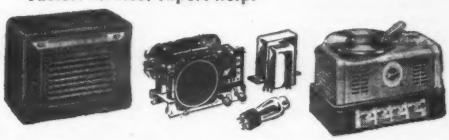

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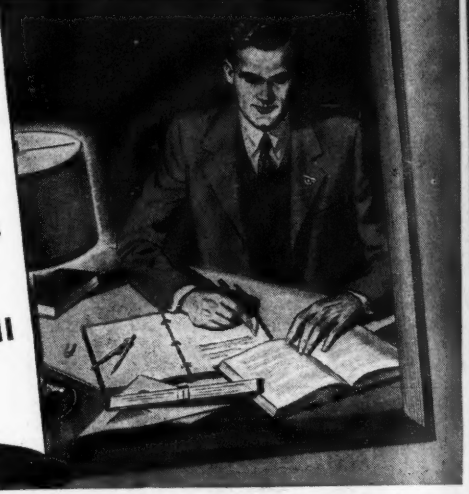

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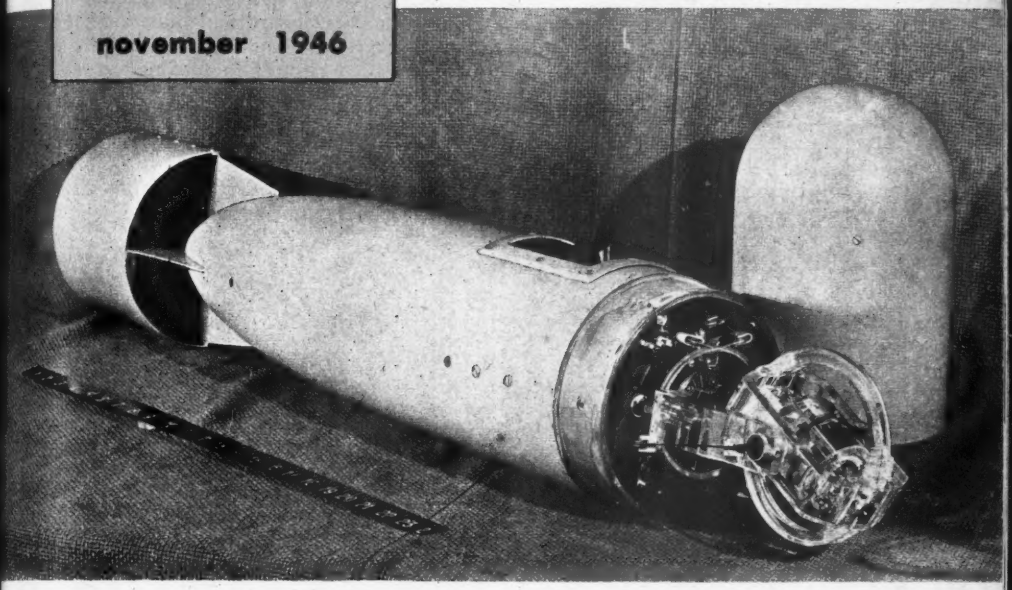
The "bird," its nose removed, showing the orienting mechanism of the detector.



doodlebug—mad prospector

BY DR. L. H. RUMBAUGH, Chief, Research Dept., Naval Ord. Lab.

As fast as the plane flies the "doodlebug" charts the oil and mineral possibilities under the ground beneath.

Dr. L. H. Rumbaugh, scientist who helped develop the aerial prospecting device.

PROSPECTORS may now put Mad, the aerial "doodlebug," to work in an aerial search for hidden mineral deposits.

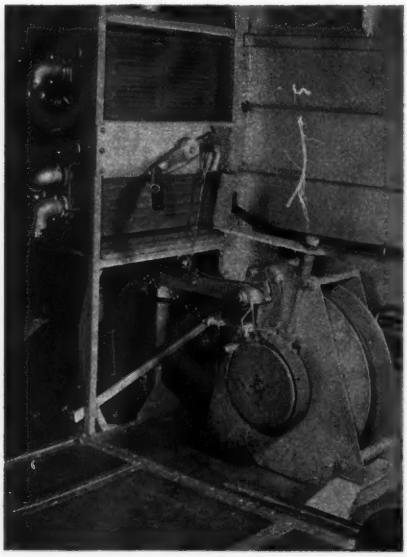
The nickname is derived from the new scientific device's full title, "magnetic airborne detector." When trailed from an airplane, Mad automatically charts the oil, coal and other mineral characteristics of the area below it. Hitherto unknown metal riches can be directly located in this way, and vital geo-

logical data can be collected which in turn will indicate the probability of petroleum deposits. Otherwise inaccessible territory, on land and sea, can be rapidly explored.

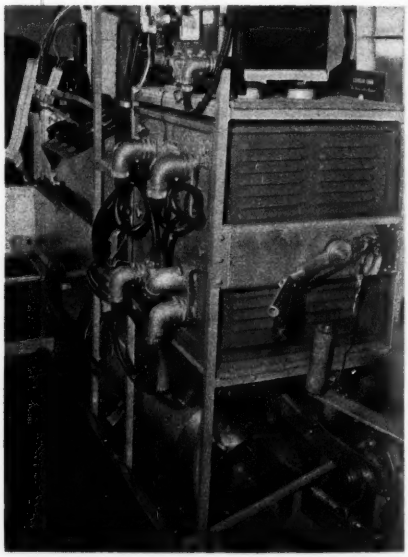
The doodlebug itself—usually termed a magnetometer—is a slim, bomb-shaped object which in use is suspended from a hundred-foot cable, to free it from the magnetic influence of the airplane. Its findings are fed through the cable to recording equipment installed in the plane —a Navy PBY. Over water, Mad is used in conjunction with Shoran, the Navy's short-range navigation instrument, so that while the doodlebug is recording mineral conditions under the sea, or along the continental shelf, Shoran is charting their actual positions. In searching over land the device is synchronized with aerial cameras. It functions equally well over land and water.

Mad was originally devised for the tracking of submarines by aircraft flying over the sea. When installed on an airplane's wing or on the forward belly of a blimp, the device reacted magnetically to the iron and steel of any U-boat which might be below, activating a needle on the instrument board and thus notifying the aircraft's crew of the presence of the raider. By circling according to the needle the pilot was able to determine accurately the position of the sub and to attack with the assurance that his bombs were finding their mark.

Mad works on the same principle as the land magnetic detector used by miners in prospecting ventures, but it is much more sensitive.



Winch and cable-reel in U. S. Geological Survey plane, for streaming and retrieving the "bird."



View showing electronic units for magnetic detector. Note "bird" stowed below in bomb bay.

Geologists have long dreamed of an airborne instrument which could help them make widespread preliminary surveys in remote and inaccessible areas and under rough terrain and below the sea; now Mad enables initial studies of such areas to be made more than 100 times faster, and far more accurately, than any magnetic means previously known. It will not only be one of the main tools used in mapping new national resources, but may also be used

How Mad can be used to locate a submerged submarine.

The housing at the rear of the PBY furnishes alternate storage for the airborne detector.

in the study of off-shore geological formations. U. S. Coast and Geodetic Survey officials hope the device will make it practicable to prepare accurate and complete magnetic maps for navigational purposes on a truly world-wide scale.

The biggest advantages of the new method are its speed and the fact that it can be used where ground surveys are either impracticable or impossible. An average plane speed of 150 mph seems adequate, so that, allowing for time losses, 9,000 miles of traverse can be flown in a month by a four-man crew.

Mad's superior speed over the ground makes it much cheaper than the ground method on a per-mile basis. In one instance it made a survey of 3,170 square miles which would have cost about 17 times as much by dip needle and required about 80 times the field time.

Its chief value lies in its ability to outline promising areas for later intensive investigation by ground parties. But even so, airborne surveys have much better detail and accuracy than those obtained by surface reconnaissance. One reason is that the plane's magnetic record is unaffected by surface rails, pipes or other foreign materials whose magnetic effects lessen with distance. At 300 feet above ground the only interference factors thus far observed are large direct-current loops; at 1,000 feet the only interference is large cities.

Mad draws a continuous record for the area over which the instrument is flown, ensuring that no magnetic features are missed. And it permits measurements to be made at more than one level, allowing geologists to gather information which will yield more conclusive answers as to the presence of oil and mineral deposits.

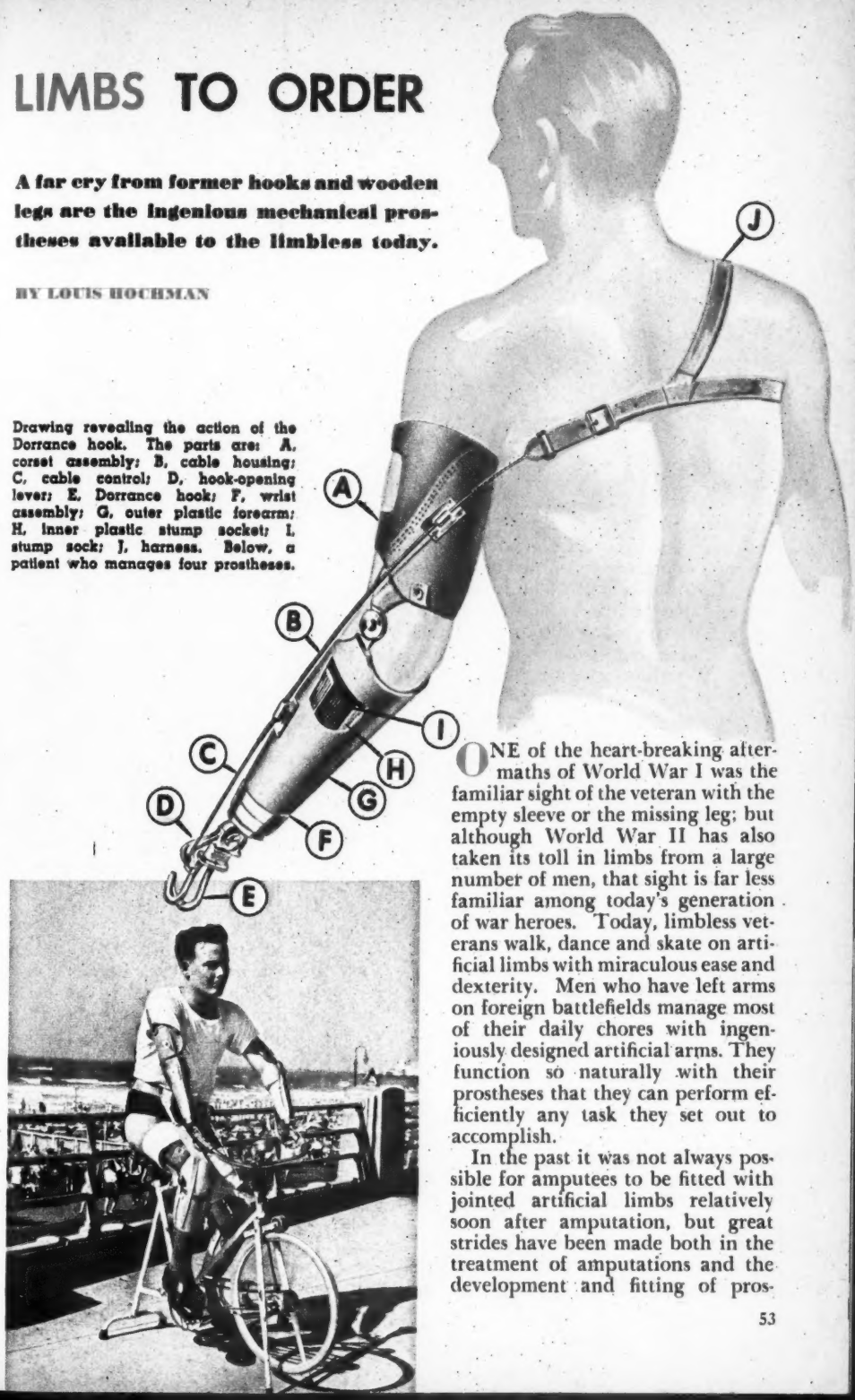
Mad has limitations. The equipment weighs over 300 pounds, requiring a plane of moderate size. A pilot and operating crew of at least two and preferably three men is required. The small prospector will hardly be able to afford the method except through contract arrangement.

This Beechcraft, especially equipped with magnetometer and accessories, is to be used for making magnetic surveys throughout the United States.

LIMBS TO ORDER

A far cry from former hooks and wooden legs are the ingenious mechanical prostheses available to the limbless today.

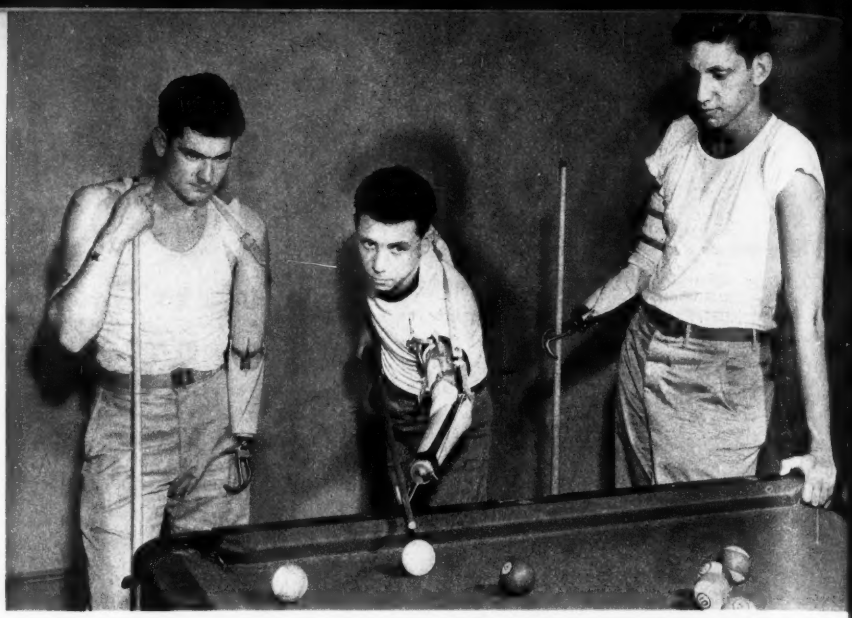
BY LOUIS HOCHMAN



Drawing revealing the action of the Dorrance hook. The parts are: A, corset assembly; B, cable housing; C, cable control; D, hook-opening lever; E, Dorrance hook; F, wrist assembly; G, outer plastic forearm; H, inner plastic stump socket; I, stump sock; J, harness. Below, a patient who manages four prostheses.

ONE of the heart-breaking aftermaths of World War I was the familiar sight of the veteran with the empty sleeve or the missing leg; but although World War II has also taken its toll in limbs from a large number of men, that sight is far less familiar among today's generation of war heroes. Today, limbless veterans walk, dance and skate on artificial limbs with miraculous ease and dexterity. Men who have left arms on foreign battlefields manage most of their daily chores with ingeniously designed artificial arms. They function so naturally with their prostheses that they can perform efficiently any task they set out to accomplish.

In the past it was not always possible for amputees to be fitted with jointed artificial limbs relatively soon after amputation, but great strides have been made both in the treatment of amputations and the development and fitting of pros-



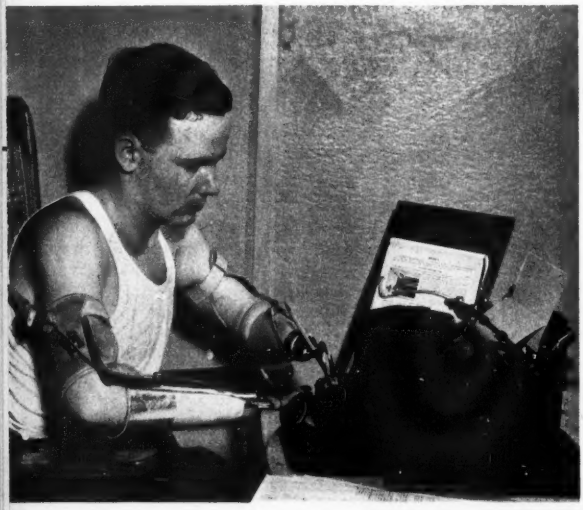
Their prostheses do not prevent these vets from shooting a good game of pool.

theses, so that today a far greater percentage of amputees have learned to walk on artificial limbs—a skill which is very difficult and may be impossible to develop if too great a period of time has elapsed between amputation and the fitting.

Use of the peg leg as a temporary limb has been largely discontinued due to the bad walking habits it encouraged. Instead, patients are fitted with a jointed artificial limb which, being adjustable, can be applied soon after the final surgery is done. This is probably the greatest advance that has ever been made in the handling of amputations.

To simplify and speed up the manufacture of the limbs, the Army has adopted wood fiber prostheses, which can be made in quantities, in assorted sizes. Light and durable and embodying the best mechanical principles, they lend themselves readily to adjustments of all types, and mechanics can be trained by experienced limb fitters to adjust them in a fairly short time. Each amputation stump must be fitted individually in the limb shop—usually from a plaster mould.

Just how the artificial limbs work is a big mystery to the average layman. How does a legless individual manipulate the mechanism of his alien member with only a stump? The secret lies first in the delicate balance of the leg's construction, then in the strap fittings and the pelvic belt control which regulate its movements. In order to make the movements as natural as possible, many improvements were made in the construction of



This chap types very well. Note the hook-held pencils, to soften the touch.

the knee, ankle and toe joints.

The latest knee joint is made of aluminum with a built-in friction brake and roller strap control. These features, being adjustable, make it possible to stiffen or loosen the swing of the shin to suit the walk of the individual wearer.

The new aluminum ankle is one-third the weight of the old fixed wooden one, and has a self-adjusting toe-out feature for people who walk either slightly toed-in or toed-out, thus making for more stable balance. The toes have rubber-cushioned joints, hinged with leather underneath, to give them the natural bend when walking.

The patient with an above-knee amputation, fitted with such a limb, walks with the same muscular motion of his former natural limbs. His stump fits into a new type of thermo-

Pfc. Green's so used to his arm that he forgot to take it off, one night!

This photo was taken at a dance, the trouser legs being raised only for the camera, to show the prostheses.

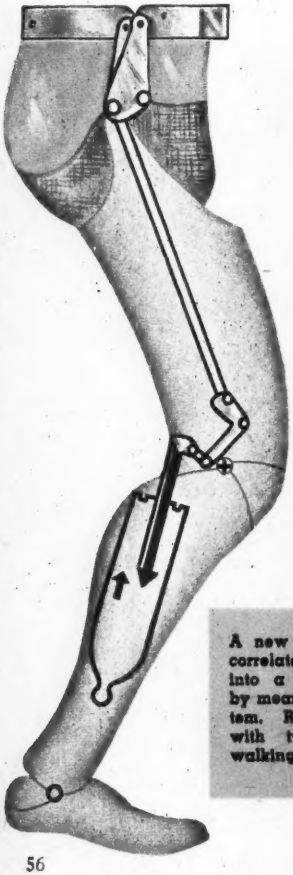
setting plastic stump socket which has been found to be more durable than wood, lighter and more sanitary than leather, and to have less than two percent moisture absorption. The pelvic belt control, a stiff belt with a jointed metal brace connected to the limb, fastens around the patient's hips and controls the turn of the limb with the pivot of the body. It also holds the limb to the stump when the limb is lifted.

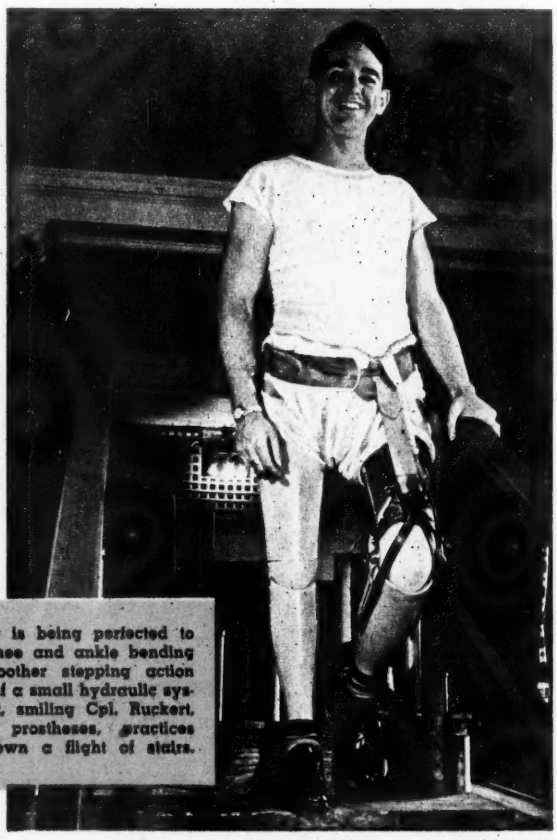
When he walks, he leads off with his good leg, then by lifting the stump, the knee joint bends and elevates, raising the foot off the ground. As he swings his stump forward, the elastic forked strap, running from the front of the pelvic belt control to the artificial shin, pulls the shin forward until the brake, or the tight pivot joints in the knee, stop its forward swing. The leg is now extended forward and the patient can set down on its heel. As the heel hits the ground, the backward ankle action permits the foot to come down flat. The patient then rolls forward on his limb. The ankle joint pivots until the shin is at a 90-degree angle with the foot, then locks, forcing the walker to the ball of the foot and compressing the toe action. The heel thus raised keeps his shoulder on an even plane.

When standing on the artificial limb, the amputee's weight rests on the rim of the stump socket.

A patient with a below-knee amputation has a limb with similar mechanical controls, the knee joint being eliminated and the limb attached directly to his thigh by means of a leather corset.

The GI who has lost an arm generally finds himself more handicapped than the one without a leg. Improvements are con-





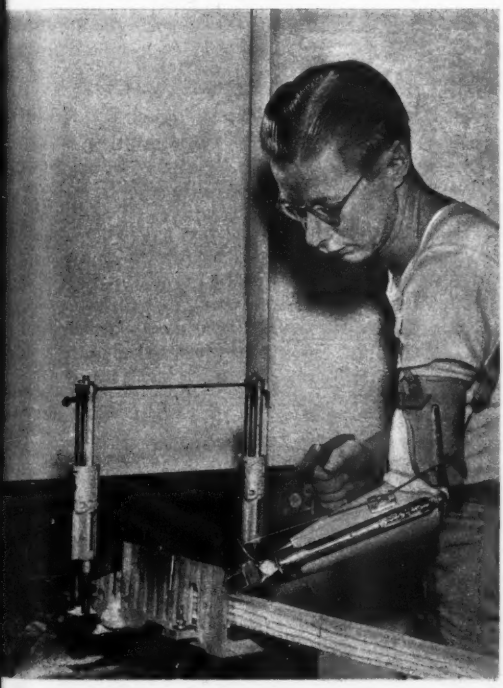
A new leg is being perfected to correlate knee and ankle bending into a smoother stepping action by means of a small hydraulic system. Right, smiling Cpl. Ruckert, with two prostheses, practices walking down a flight of stairs.

stantly being made in the artificial arms provided, however. Today, fitted with a mechanical hook which he controls by means of a cable attached to his opposite shoulder, he can accomplish many of his daily chores, such as dressing himself, buttoning his clothes, handling a knife and fork, writing, turning door knobs, dialing telephones, and so on. If he has even so much as two inches of bone below the elbow he can execute an amazing number of arm movements.

The hook, which has been found to be the most useful design, is a hinged affair, double, held tightly closed with rubber bands. When the amputee wants to pick up something he first opens the hook by moving his opposite shoulder forward (the cable ends at a projecting lever on the hook), then, by relaxing his shoulder, allows the hook to close on the object. The hook is set in a tight swivel fitting, and the patient uses his good hand to turn the hook to the desired angle. Above-elbow amputees bend the artificial elbow by means of a cable control from the opposite shoulder, and the elbow can be locked.

Some artificial arms have wrist attachments which adapt the arm for many types of work. The hook can be removed and a small chuck fitted into its place. This chuck will accommodate such specially designed attachments as a knife and fork, nail file, hooks, and hair brush.

These and many other refinements have been and still are being worked on at the Thomas M. England General Hospital and other military amputation centers where scores of amputees come in on litters and walk out on new, made-to-order limbs, to again stand with others on an equal footing in this competitive world.



Above, sawing with a mitering unit. There's very little that a man with an artificial arm can't do.

There's a chuck in the wrist of the prosthesis. Into it can be fitted every one of these attachments.

black light magic

"BLACK" light, whose rays are so short that they are invisible to the naked eye, is playing a very visible and important role in the world.

Its rays lie in the ultra-violet end of the spectrum. They are produced by mercury vapor lamps and tubes, and filtered through glass so dark that it looks black. Though invisible, they make fluorescent substances glow in the dark. For this reason they may be made to serve as chemical analyst, inspector, detective, and entertainer.

There's a laundry mark on this shirt, but you'd never know it, under ordinary light.

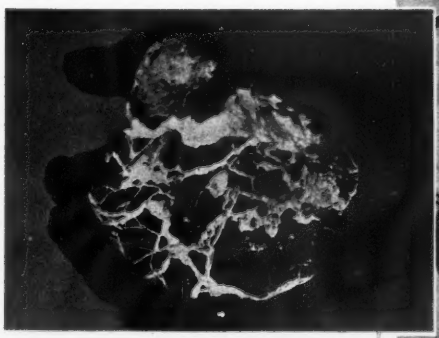
The mark is in invisible fluorescent ink. It glows forth clearly under black light.

Left, the hook of the fire alarm box has been coated with a fluorescent powder—and black light traps the box-puller by his glowing fingers. Below, the girl applies fluorescing grease paint and ribbon to obtain, under the magic of black light, the effect at the right.

Photos by European

One great user of black light is the mining industry. Mercury, zinc, zircon and many rare ores fluoresce under its rays, and prospectors carry portable projectors. Black light is credited with locating scheelite —source of tungsten—worth over 100 million dollars.

Fluorescent substances are harmless to health. They are not to be confused with radium and phosphorous compounds.

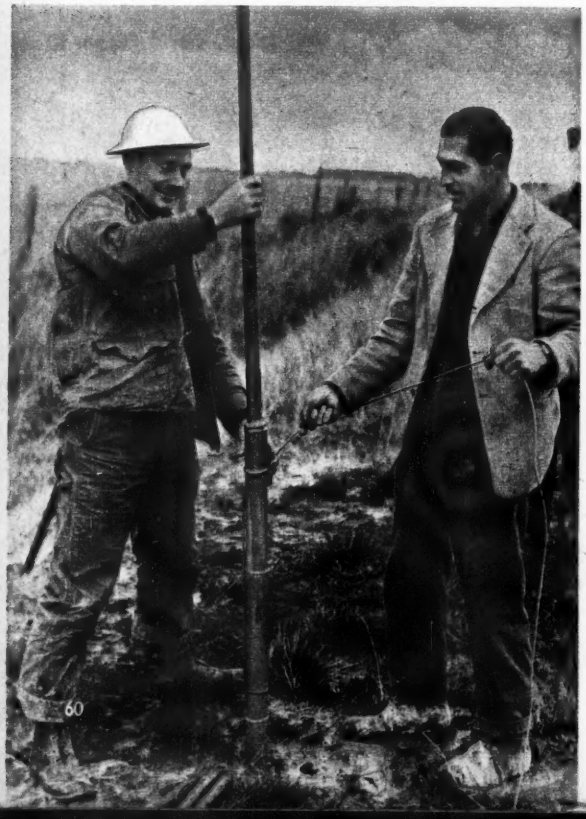


White light tells nothing, but black light identifies the stone as valuable scheelite.

WIGGLE-PICKING for OIL

BY BEN MAXWELL

You don't have to drill 5 miles down to find oil with the wiggle-picker.



THERE'S black gold in them thar hills. Oil! But where?

For the answer to that question, oil prospectors call for the wiggle-picker. With the wiggle-picker, they can locate beds of petroleum as deep as five miles beneath the earth's surface without the expense and toil of drilling to great depths until they're sure they'll hit the jack-pot.

Here's how it works. First, the geophones take up their listening posts. They are simple looking little gadgets, as you can see on the opposite page, but actually they have the amazing ability to transform linear motion of vibration into electrical energy. Ten or twelve of them are placed about 200 feet apart along the ground.

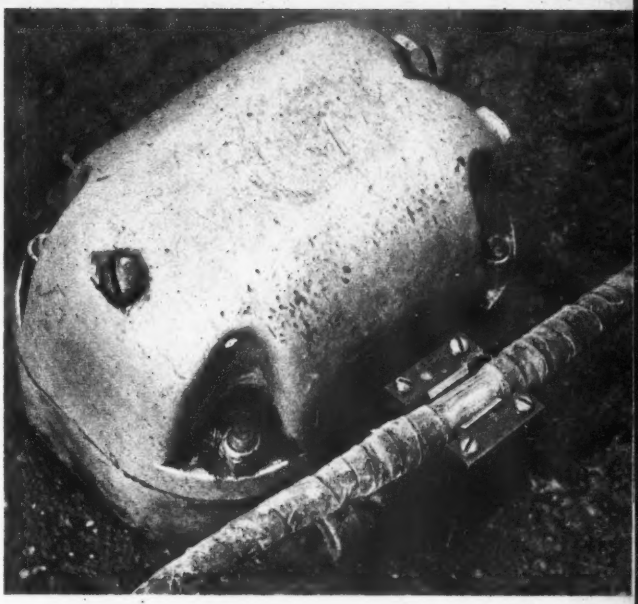
Next, a small charge of dynamite—varying from four ounces to 15 pounds—is placed in a hole previously drilled to 40 or 50 feet by a portable rig.

Lower away the dynamite and fire —if it echoes, there's oil below.

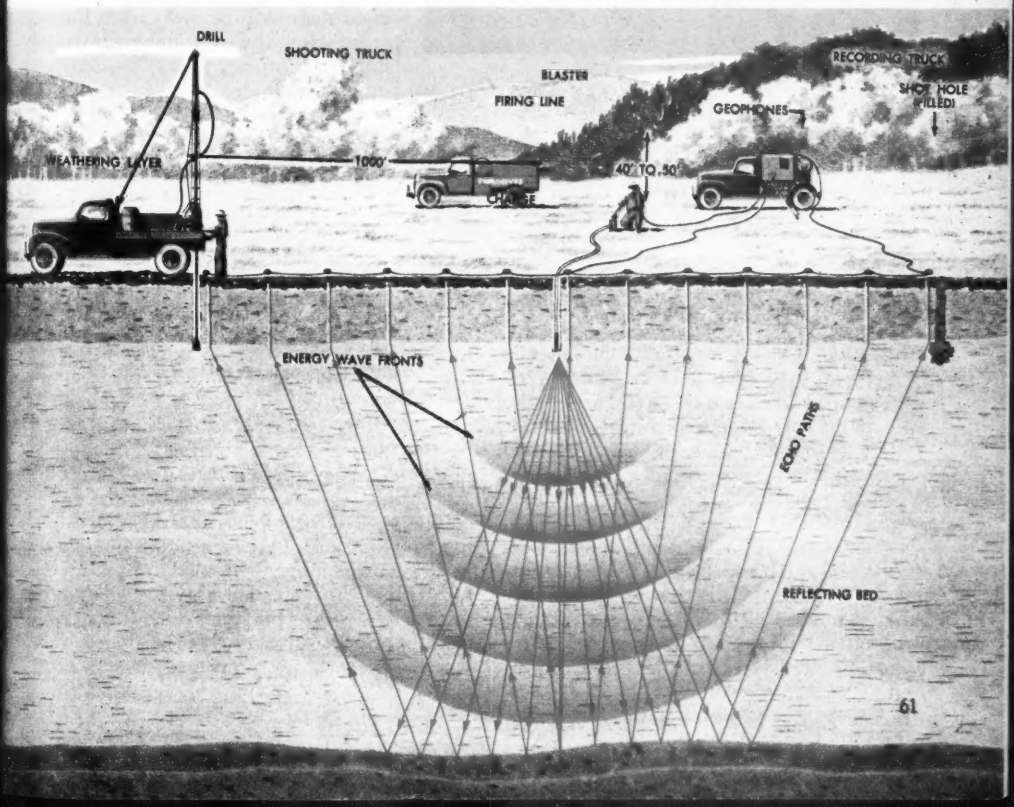
When the charge is fired, energy from the blast radiates spherically into the earth's crust and is reflected by the various components which lie below the surface. The geophones pick up these reflections, or echoes, and transmit them electrically to a recording truck where they are reproduced on moving photographic paper.

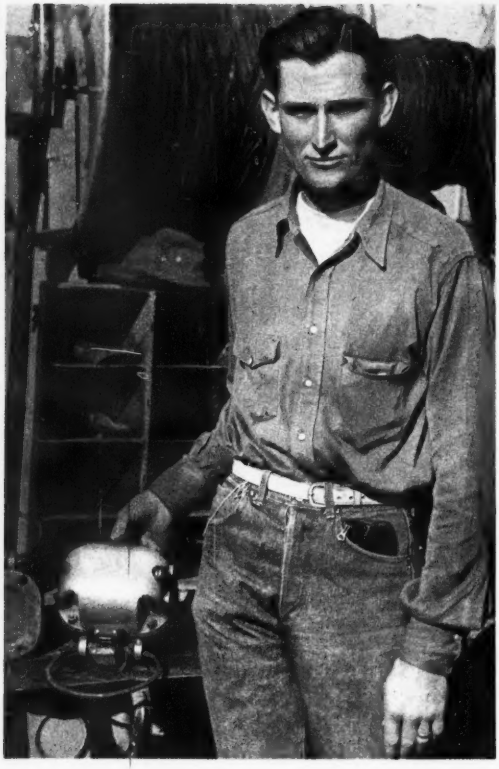
While this is going on, the portable drill rig on the drill truck is busily sinking another hole a thousand feet farther on. This procedure of drilling, blasting and listening for echoes is repeated until the edge of an oil bed is located.

When pay dirt is discovered at last, the wiggle-picker is moved in various directions until the exact depth, size and shape of the oil bed is charted. Later, this same bed will be re-charted, for these underground lakes of oil are often



Sh! That geophone above is listening for an echo to whisper the good news that there's oil a mile down. Below, 13 of them concentrate all at once.





When this simple looking gadget finds an oil bed, wiggly lines appear on photographic paper.

found to be moving. They may be rising, getting deeper or traveling horizontally—all very slowly, of course.

The geophysicist determines all this by studying the wiggly lines on the photographic paper. The camera that supplies these wiggly lines consists chiefly of an oscilloscope which reproduces a pictorial graph of the echoes from the blast transmitted by the geophones.

The time elapse between the blast and the echoes is a measure of the depth of the reflecting bed. The wiggly lines which the geophysicists study have earned the nickname of "wiggle-picking" for this method of locating oil—or to be technical—seismograph computing.

Long ago, geologists developed the anti-clinal theory for explaining the existence of natural gas and oil deposits beneath the earth's surface. This view, now generally accepted, is that hydrocarbons, the elemental principles in natural gas and oil, accumulate in folds in the earth's crust, usually convex in shape and topped by a dome filled with gas.

These hydrocarbons originate from remains of some 50,000 species of marine and plant life laid down in the dim ages of past geologic epochs. Each organism contributed its drop or more of oil to the accumulated deposits which, by a long process, eventually become the oil and natural gas that speed our modern social and industrial life.

Gradual changes in the contours of the earth—though sometimes these changes are helped along by an earthquake or so—are responsible for the forming of basins of marine sediments. These basins, usually overlaid with sand and shale, have been formed during inconceivable ages of geologic time.

As the marine life decays and begins to form oil, gas rises through the moist sediment until it finally is stopped by the hardened shale sloping away from the crest. Here the gas is held captive until it is tapped at last by some enterprising oil man.

The most extensively used method of helping him locate the gas and oil is the seismograph, or wiggle-picker which, as explained here, correlates the vibrations set up by man-made earthquakes with the components of the earth's outer crust.

Mapping of the geologic structure, from which raw materials yielding hundreds of petroleum products are obtained, is now being done along the Pacific coast by the Geophysical Service, a corporation working for Standard Oil of California.

After a thorough study of various methods, the wiggle-picker was found to be the most practical. Being light and portable, the equipment can cover almost any terrain.

The rotary drill rig is capable of drilling a 50-foot hole, five inches in diameter, in 30 minutes. The drill trucks carry bits for drilling through sand, clay, gravel and soft rock. Hollow bit stems permit water to be pumped out of the holes, if necessary, while they are being drilled.

does the electric chair KILL?

Or does it only shock into seeming death, so that the autopsic knife is the real killer?

BY LESTER DAVID

JOHN DOE, murderer, is strapped into the electric chair. The guards check to see if the sponge-cushioned electrodes touch his skull and right leg. They examine the wide leather belts. They step back and signal. The executioner plunges a switch and 2,300 volts of electricity hurtle through John Doe's body.

The murderer is jolted convulsively against the straps which bind him to the massive, oaken chair. Blue smoke spirals from the top of his head and an acrid odor assails the nostrils of the witnesses on the backless wooden benches of the execution chamber.

The current ceases, the doctor steps forward and applies his stethoscope.

"This man is dead," he pronounces.

But *is* he dead?

Has his life been burned out by the surging current, or has he only been shocked into a semblance of death, with the real end to come in the autopsy room an hour or so later?

Recent researches in the effect of electricity on the body have stirred eminent doctors into a controversy once again. The cleavage is sharper as more developments come to light.

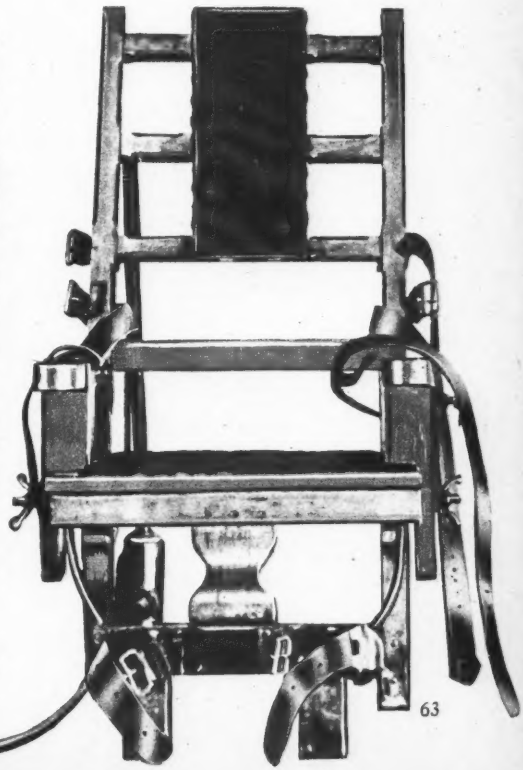
Science has learned that high voltage currents almost never kill their victims outright. Nerve centers are instantaneously paralyzed and death occurs from suffocation when respiration is not maintained artificially.

In innumerable cases victims have been revived after as much as 12 continuous hours of artificial respiration.

The body reacts differently to high and low voltage shocks. High voltages paralyze the nerve centers, and breathing stops at once. Low voltages affect the heart, causing "ventricular fibrillation"—which means that the electricity causes the different muscle fibers to flutter independently, halting all organized pulsations. Unless immediate action is taken to make the muscle fibers contract and relax in unison, the victim dies within a few minutes.

The one attempt on record which might have proved that an electric chair victim can be revived successfully came within an ace of succeeding.

In 1928 the notorious Ruth Snyder and Judd Gray walked the last mile in New York's Sing Sing Prison. On the evening of the execution, Lewis E. Lawes, then warden, was dramatically served with a writ by Ruth Snyder's attorney, forbidding an autopsy. The attorney, Joseph V. Lonardo, planned to rush his client's



Since high voltage rarely kills outright, how many murderers are merely suffocated to death?

body to a nearby hospital where a waiting doctor would inject adrenelin to counteract the ventricular fibrillation and start the heart beating normally.

The plan failed because Lawes ignored the writ on the ground that it was not properly signed by a judge. The autopsy was performed as usual and the question remained unanswered.

The voltage used in an electric chair ranges from 2,000 to 2,300 and the amperage from 11 to 13. But many cases are on record in which victims lived after absorbing far greater voltages and amperages.

A worker on a high-tension electric transmission tower in the south accidentally touched a live wire and 33,000 volts —15 times the charge in an electric chair —coursed through his body. He fell 30 feet to the ground—and was revived.

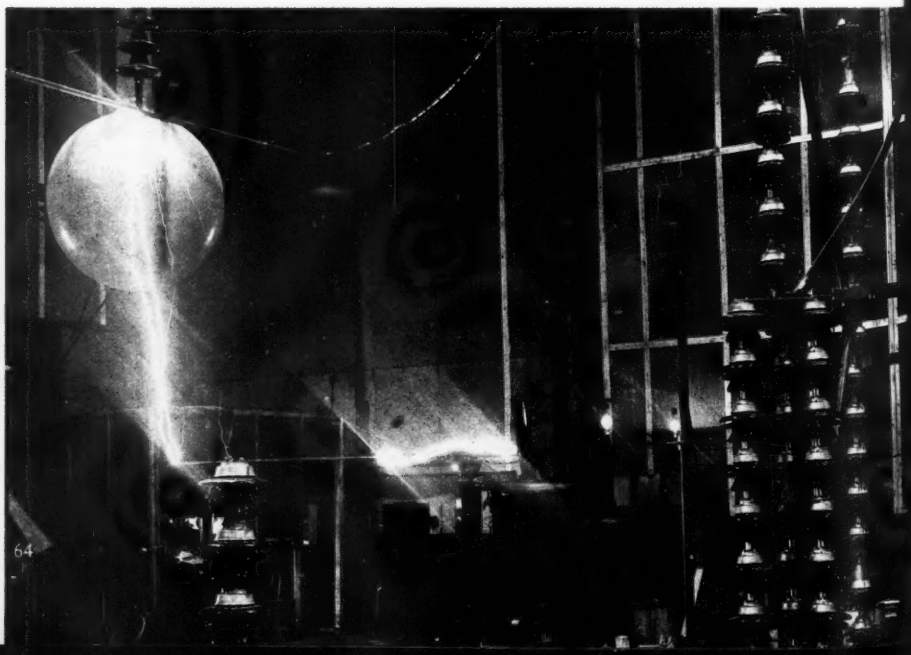
An X-ray technician at Bellevue Hospital in New York City, weary at the end of a long day, stumbled against a live plate and absorbed 75,000 volts. He was rushed into an iron lung at the hospital, where his breathing was artificially maintained until his nerve centers revived and he could breathe independently.

The electric chair has been widely proclaimed as being among the most humane methods of execution yet devised. Certainly no one can quarrel with the humaneness of the chair in comparison with most other means of snuffing out human lives in the course of history: boiling, burning at the stake, crucifixion, stoning, slow strangulation. Whether it is more humane than hanging, beheading or lethal gassing is, however, open to question in the light of scientific researches.

Does the electric chair hurt? The case

Gov. Olson talks to a wife murderer, sentenced to hang. Is the noose more humane than the chair?

It is a mistake to suppose that high-voltage electricity brings death as quickly as it itself moves.



This man sits safely in his "electric chair" while three million volts streak past him to the ground.

Rev. Irwin A. Moon easily stands a charge of a million volts of high-frequency electricity.

of Willie Francis, 18-year-old Negro youth from Louisiana, has revived interest tremendously. Willie, who miraculously escaped when faulty wiring of the State's portable electric chair prevented him from getting the full dose of current, said when astounded guards unstrapped him:

"It just tickled a bit."

But of course the case of Willie—who is now fighting to avoid a second trip to the chair—does not prove the point. The experience of A. B. Rose, of Winston-Salem, N. C., however, casts important light on the question.

Rose was holding a grounded wire when it was struck by lightning. He was knocked unconscious, rushed to a hospital and revived after several hours. Rose said:

"When the current hit me I felt that every bone in my body was breaking. Every tendon seemed to snap—a hundred million red-hot needles stabbed me. Then I saw a sheet of blue flame and I passed out."

On the other hand, Dr. Amos Squire, for many years prison doctor at Sing Sing, has this to say:

"Current entering the body at the top of the head travels to the brain faster than the nerves can convey sensation. Before the nerves first attacked at their terminus on the surface of the body can convey a message of pain to the brain, they are knocked out of commission and any message they may have tried to dispatch is outdistanced by the current, which paralyzes the brain before it has a chance to feel anything."

The executioner must get the condemned man's general physical specifications to guard against mishaps. One man had become so emaciated in prison that the electrode slipped down his shrunken leg, and only swift, last-minute changes prevented a slip-shod execution.

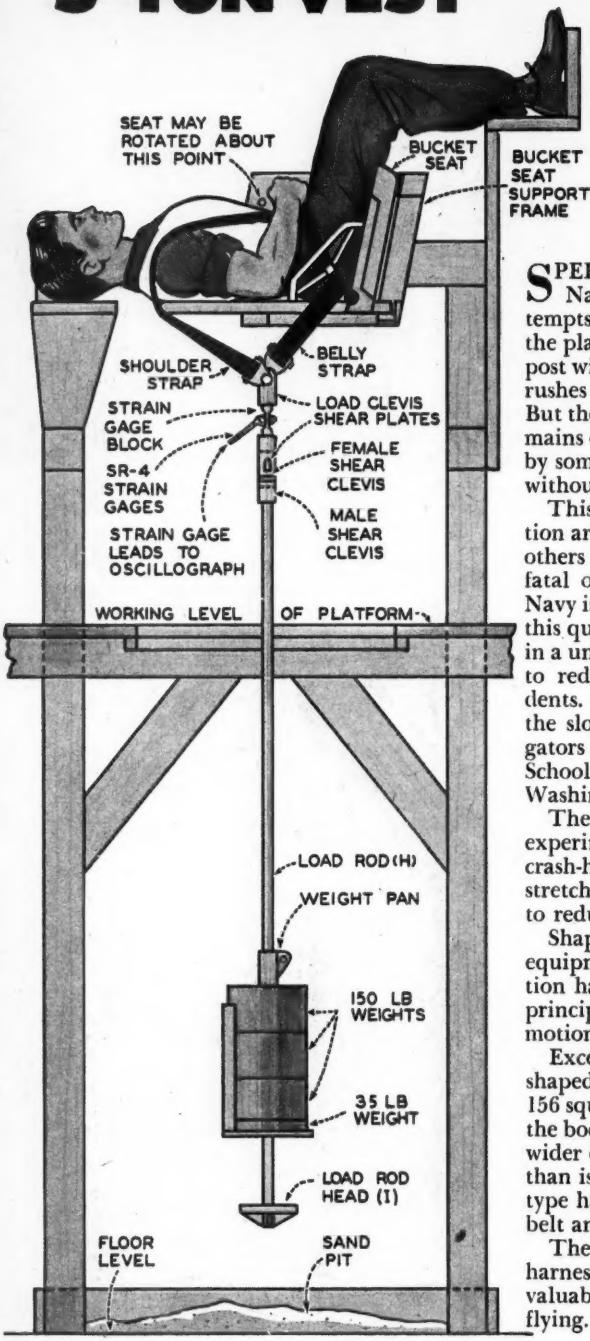
In Sing Sing, the chair is bolted to the floor. Eight heavy straps bind the condemned man: chest, waist, each upper arm, each forearm and each ankle. The electricity enters the body through two electrodes, one on the head, one on the right leg. Between the electrodes and the flesh is placed a sponge soaked in brine, for perfect conductivity.

As for the technique of the execution, the switch is thrown at the maximum voltage, 2,000 in this case. In five seconds, the executioner decreases the voltage to 1,000 to prevent sparking and unnecessary burning of the victim. At the end of a half minute the voltage is stepped up to 2,000, then decreased again to 1,000 after five seconds. This is repeated usually for five successive shocks. Then the doctor steps forward with his stethoscope.

5-TON VEST

BY JAMES NEVIN MILLER

With this safety-belt you can crash at 100 mph, stop within five feet—and live.



SPEEDING down the runway, a Navy pilot of a Vought Corsair attempts a takeoff. But instead of rising, the plane wavers and strikes a concrete post with terrific force. An ambulance rushes to the scene to pick up the body. But there isn't any corpse! All that remains of the Corsair is the cockpit, but by some near miracle the pilot escapes without a scratch.

This was an actual case and the question arises: if this man lived, why can't others live who undergo these usually fatal occurrences? The United States Navy is now seeking to answer not only this question but scores of related ones in a unique research program designed to reduce fatalities in airplane accidents. "Tomorrow they may live" is the slogan of a little band of investigators stationed at the Navy Medical School at Bethesda, Md., just outside Washington, D. C.

The new program involves a series of experiments with a new-type, airplane crash-harness designed to utilize the stretching property of undrawn nylon to reduce aircraft deaths.

Shaped like a fencer's vest, the new equipment is known as the "deceleration harness" because it works on the principle of decelerating the forward motion of the body upon crash impact.

Exceedingly lightweight, the vest is shaped to provide a wide covering area, 156 square inches, on the upper part of the body. As a result, a more even and wider distribution of strain is attained than is possible with the present rigid-type harness which consists of a safety belt and two shoulder straps.

The principles involved in the new harness are expected to prove equally valuable to military and commercial flying. Loss of life in commercial

Old style belt broke into pieces under 3,100 lbs. pressure. Luckily, subject was a dummy.

Wearing 5-ton vest, volunteer is about to take 10,000 lbs. For what happened, turn the page.

crashes often results from passengers being thrown from their seats and fatally injured against the cabin walls, ceilings or other plane obstacles. The vest also offers great possibilities in accidents involving automobiles, buses and trucks. For truck drivers and bus operators on long hauls who might fall asleep, or for drivers in auto races, the harness may offer a new form of life insurance.

Tests I saw the other day proved conclusively that the vest can withstand, without stretching, up to 3,300 pounds and can absorb—by stretching—over 10,000 pounds of impact. To appreciate this fact you must realize that a shock of 10,000 pounds is roughly equivalent to an impact which might be received when a plane flying at 100 mph plows straight into the ground and stops within five feet. This, the scientists told me, is about the same as 65 G's of force, or 65 times the force of gravity exerted on a 150-pound man.

Navy officials say that both the present conventional type of harness and the crash variety have been subjected to more than 2,000 tests at the Navy Research Institute at Bethesda. Thirty officers and enlisted men attached to the institute have participated in the experiments on a voluntary basis. Three outstanding scientists on the job there are: Commander Howard R. Bierman, Medical Corps, U.S.N.R., of Oakland, Calif.; Lieutenant (j.g.) Harper K. Hellems, Medical Corps, U.S.N.R. of Ronceverte, W. Va.; and Lieutenant (j.g.) Russell Wilder, Jr., Medical Corps, U.S.N.R., of Rochester, Minn.

Commander Bierman started his unique research many months ago while serving as flight surgeon on the Enterprise and the Lexington, and was assigned to his present job at Bethesda about a year ago.

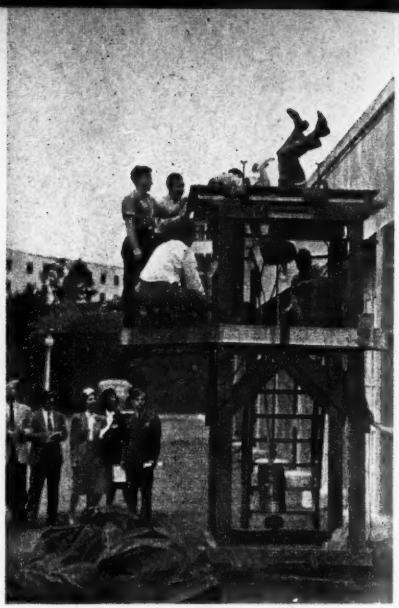
The impact decelerator, designed for studying linear accelerated forces, consists of a 14-foot platform, a weight suspension rig, and recording instruments. The subject, wearing the crash harness, lies on his back on the platform and a 500-pound weight is attached to slide on a steel rod leading down from the back of the harness. At a given signal the weight is allowed to fall freely for a distance of five feet, and this takes less than two-tenths of a second. The shock of the weight which transmits itself to the harness is equivalent to 10,000 pounds of impact, or 2,500 pounds of energy. The shock can be varied, but 10,000 pounds is considered a practical maximum.

I saw both types of harnesses tested and what a difference! When the conventional seat belt was tested with a wooden dummy it failed to withstand pressures beyond 3,100 pounds and broke into pieces. In an actual crash such impacts probably would smash the belt and throw the pilot forward. There'd be nothing gained if this particular type of harness were made stronger. For then the force of the impact would transmit itself to the pilot's abdomen with the prospect of causing serious internal injuries.

The new harness, made like a vest, is built of three-ply, undrawn nylon developed and treated by All-American Aviation, Inc., of Wilmington, Del. The property of stretching at great pressures is peculiar to undrawn nylon. The material, however, is not elastic and has no special recoil properties.

Oooof! He feels it, all right—5 tons of impact. A few seconds later, he was grinning.

Airplane crash was simulated by the five-foot drop of a 500-lb. weight attached to the vest.



Although designed to distribute pressure over a larger area, the vest reacts to forces up to 3,300 pounds in about the same way as the conventional harness. Beyond that point, however, the stretching quality of the nylon is utilized.

Probably, because of certain "bugs" in the new device, it will be some months before the deceleration vest can be installed in planes. Officials think, however, that the results obtained thus far justify continued intensive work aimed at early perfection of the crash device.

Rarely are the forces occurring in airplane crashes uniform. No two crashes are alike and the pattern of impacts is usually uneven. A crashing plane usually strikes uneven ground and its fall is often broken by tree-tops or other large obstacles in its path. The initial impact does not usually injure the pilot. It is the instant of final or greatest impact that is dangerous and this is what the new harness is designed to guard against.

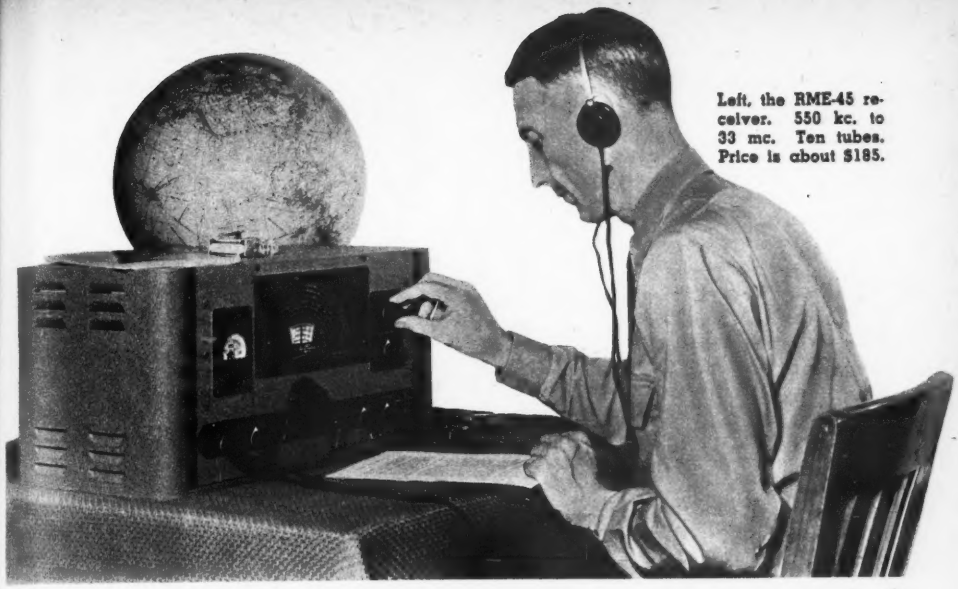
Very slight is the danger of injury or death from telescoping of a military aircraft. The cockpit is the strongest part and usually remains intact. In a serious crash the wings and undercarriage may be sheared off and the engines smashed, but personnel within the cockpit or cabin would be fairly safe if they could be protected from the shock of impact.

The entire research is closely tied in with what happens when people fall from great heights. You'd hardly suppose that a man could fall 100 feet from a ten-story building top, land on the hood and fender of a car and still live. Yet Dr. Huge de Haven, of Cornell University, an expert in deceleration problems, cites a case like this. The victim suffered a frontal skull fracture after bouncing from the car to the pavement, however.

One of the oddest cases on record occurred in France many years ago. A man fell from the top of a cliff 320 feet high, hit a ledge about half way down and bounced from it to a beach below. He suffered only a large wound on the right knee plus minor scalp cuts and bruises. Ten days later he was as good as new.

In correlating these almost unbelievable cases and their relation to auto and aircraft accidents, Dr. de Haven concludes that there is a direct relation of force to decelerative distance. He adds that a person who escapes in a high speed crash fatal to many others, owes his life to some decelerative interval and to a favorable distribution of the destructive force.

A slip on the street, however, where the head strikes the hard pavement, may induce a gravity increase exceeding 300 G's because of the small decelerative factor involved. Here the results are often fatal.



Left, the RME-45 receiver. 550 kc. to 33 mc. Ten tubes. Price is about $185.

So You Want to Become a *HAM!*

Amateur radio is a lot of fun. Here's how to start off right.

BY ROBERT HERTZBERG

THE first thing the newcomer to the amateur radio game learns is that radio amateurs *never* call themselves radio amateurs; they are "hams." Outside of radio circles, use of this word ("ham actor," for instance) is likely to result in a poke in the nose, but to radio men everywhere it is a term of fraternal friendship. And I mean *everywhere*. Ham radio is the largest organized hobby in the world and the only one that requires official government licenses.

Right, Harold Smith, W2UL, of New Milford, N. J., operates the Hammarlund HQ-129X receiver. 540 kc.-31 mc. Eleven tubes. Price is about $130. Transmitter is home-made.

A young ham enjoying himself, practicing for his license. He has a National Company NC-46 receiver. Ten tubes, four bands. Price about $90.

Don't let the license business bother you. You don't need a license for *receiving* purposes. You can buy and use any kind of communications receiver, and listen on any frequency. You do need a license when you decide that you want to go on the air with a transmitter of your own, so that you too can engage in the thrilling long-distance conversations you have been hearing. You will have to take an examination conducted by the Federal Communications Commission. The most important part of this examination is the code test. You must be able to send and receive the dot-and-dash characters of the International Morse Code at the rate of 13 words per minute. Following this, you answer a dozen or so questions dealing with the operation of radio equipment and the Federal laws governing amateur radio operation. Before Pearl Harbor, more than 60,000 people passed this test and became the proud possessors of ham "tickets," so it can't be very difficult.

The one and only restriction attached to the whole license matter is that applicants must be citizens of the United States. Otherwise, the examination is a free-for-all. Boys and girls of 11 and 12 and grandfathers *and* grandmothers five times older will often be found taking their tests together. Incidentally, the license doesn't cost a cent. It is Uncle Sam's way of encouraging participation in a hobby that has been responsible for many important improvements in the art of radio communication.

When you receive your license, you also assume a new identity. Just as broadcasting stations have call letters, so do all ham stations. A domestic amateur "call" consists of the letter W followed by a number (to indicate a certain area of the United States) and two or three letters. There are now ten call areas (there were nine before the war), the tenth being represented by 0 (zero, not "oh"). The split-up now in effect is as follows:

1: Maine, New Hampshire, Vermont, Connecticut, Rhode Island, Massachusetts.

2: New York, New Jersey.

3: Pennsylvania, Delaware, Maryland, District of Columbia.

4: Virginia, North and South Carolina, Georgia, Florida, Alabama, Tennessee, Kentucky, Puerto Rico, Virgin Islands.

5: Mississippi, Louisiana, Arkansas, Oklahoma, Texas, New Mexico.

6: California, Hawaii, Pacific possessions except those included in Area 7.

7: Oregon, Washington, Idaho, Montana, Wyoming, Arizona, Nevada, Utah, Alaska, and adjacent islands.

Amateur radio in a fine setting. The receiver is the Hallicrafters S-40. It covers 550 kc. to 44 mc. and has nine tubes. The price is about $80.

8: Michigan, Ohio, West Virginia.
9: Wisconsin, Illinois, Indiana.
0: Colorado, Nebraska, North and South Dakota, Kansas, Minnesota, Iowa, Missouri.

Typical ham calls are W1GS, W2DJJ, W3FTJ, W9MO, WOHG.

Amateur license examinations are held at frequent intervals throughout the year at about 80 scattered offices of the Federal Communications Commission. There is some slight confusion at the present time because the new amateur call areas do not coincide precisely with the FCC's inspection districts. If you want to know the exact office that handles your particular location, drop a letter or postcard to me, care of MECHANIX ILLUSTRATED, 347 Madison Avenue, New York 17, N. Y. Be sure to include your county, as some states are in divided inspection districts.

You'll want to join the American Radio Relay League, the headquarters of which are in West Hartford, Conn. Almost all the hams belong. It publishes the monthly "QST" and many pamphlets of special interest to beginners.

Most hams invest fair sums in factory-built all-wave receivers, and make their own transmitters. There's no limit on what you can do with transmitters. You can get good results from one tube and five dollars' worth of accessories, but of course that's only a beginning. After a ham has been in the game for a few months his "shack" generally looks like a corner of an atomic bomb laboratory.

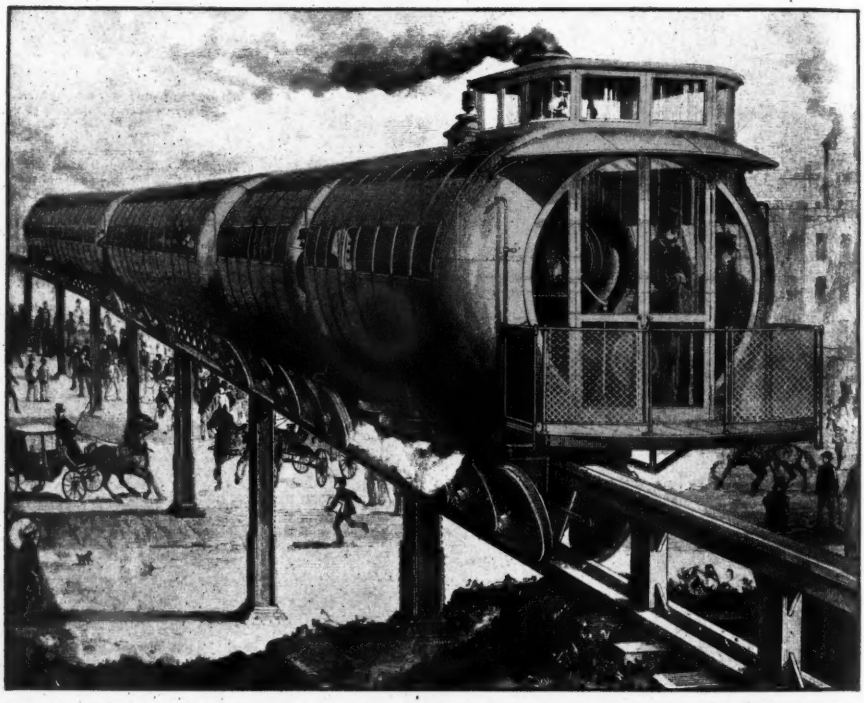
Get your license and get started!

That's not an electric heater, but an ultra-high-frequency ham antenna system operated by W. C. White (right) and George H. Floyd, of the G. E. Co.

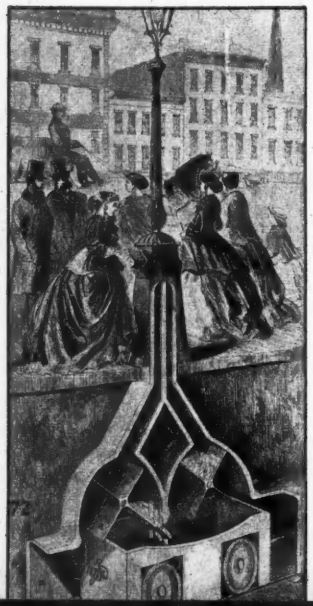
Above, Seth Card, of Malden, Mass., operates the National Company NC-2-40C receiver. Twelve tubes. Price is about $225.

Hallicrafters S-36-A receiver, a special job covering 27-143 mc. 15 tubes. Costs about $300. At the right, a 10-meter transmitter.

Grandpa was an INVENTOR!



Grandpa had this elevated street car in East Cambridge, Mass. (1886). Note the V-wheel undercarriage, the single row of supporting pillars, the streamlining. The first section is the locomotive.



WE AMERICANS are the inventingest people!

The habit started way, way back in the past. At a certain point, after it had been growing a long time, a certain conscientious U. S. Commissioner of Patents resigned. He said, "Why should I waste the taxpayers' money in a dying job? All the important inventions have already been made!"

That was a hundred years ago. Since then his department has issued two million patents.

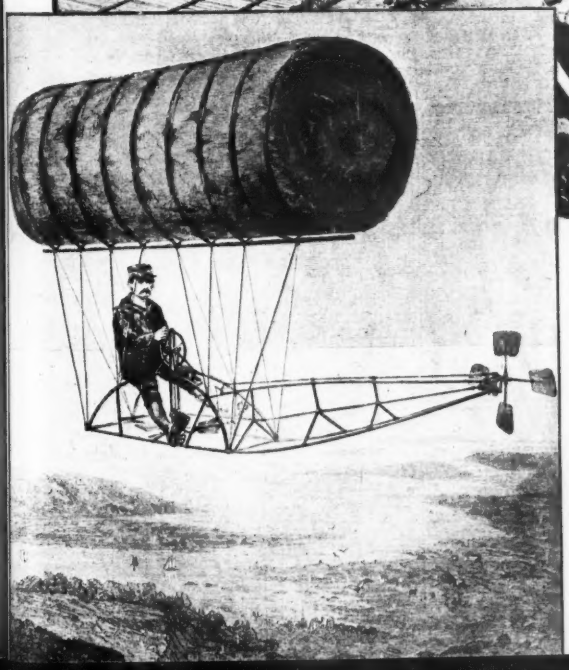
There's just something in our blood.

Grandpa was a better inventor than we're apt to think. He didn't invent radar or the atomic bomb, but neither would we if he hadn't handed us the science on which they're based.

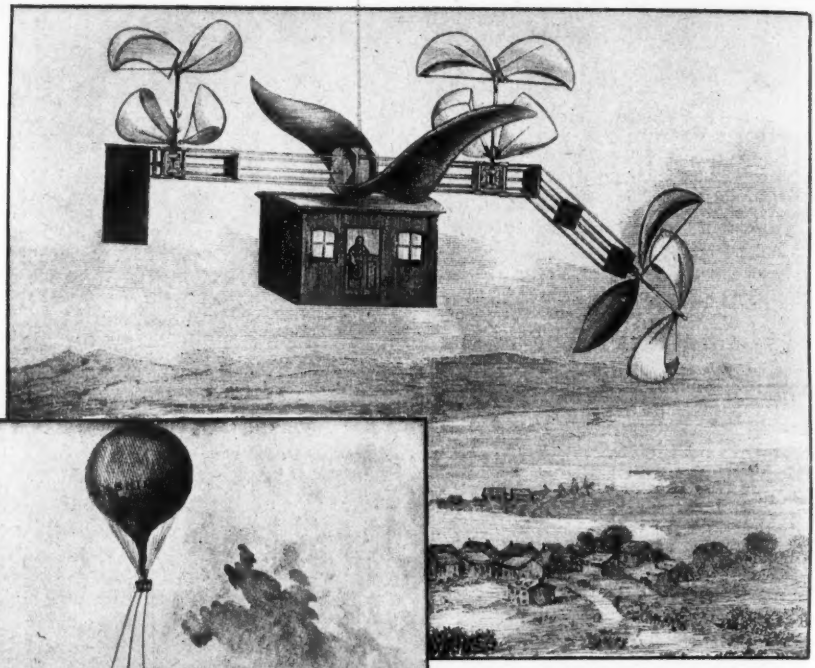
Grandpa was good! Look at these pictures!

Grandpa invented this lamp post-box, too (1867). Letters deposited above fell through the rotary mechanism into pneumatic tubes—one tube for uptown, one for downtown. Capacity, 240 letters per hour.

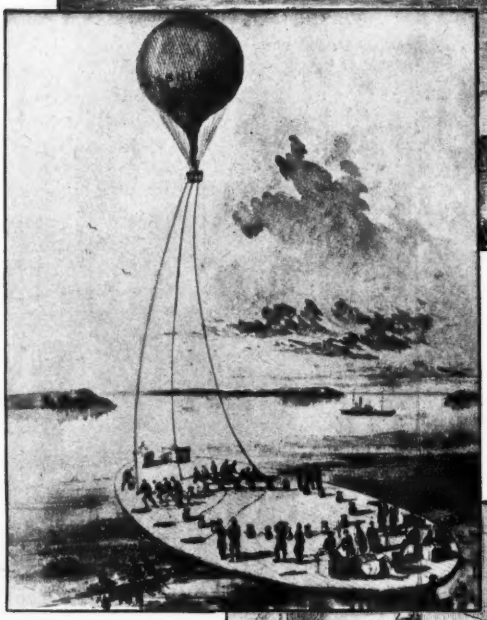
When it became evident that de Lessep's Panama Canal project would not be completed, an American engineer drew up plans for this interoceanic ship railway. Ah Grandpa!



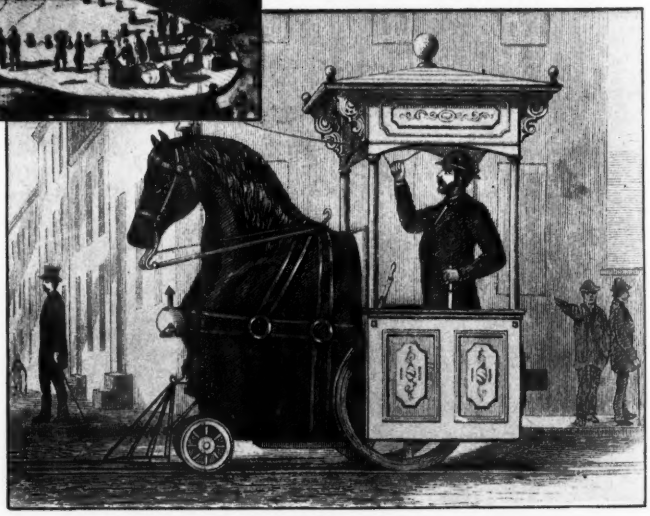
In June, 1878, citizens of Hartford, Conn., saw this foot-pedalled dirigible rise 200 feet and sail calmly about overhead for an hour. Prof. Ritchell himself was the power plant.



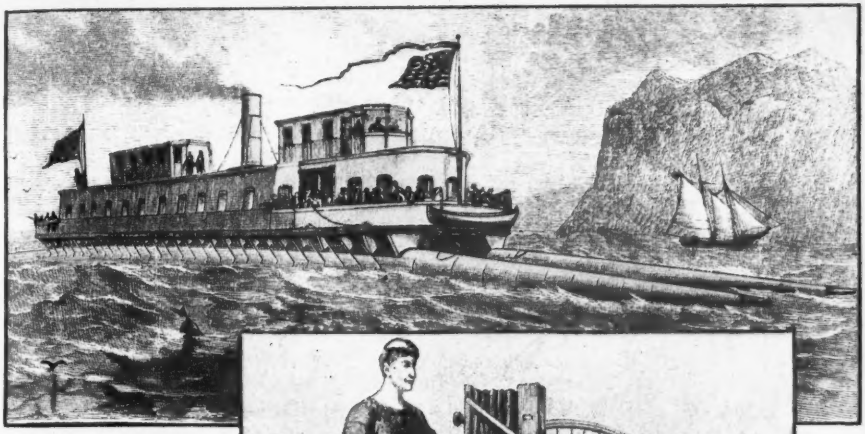
Back in 1876 W. J. Lewis, of New York, claimed that he flew a model which had wings over its boxcar cabin, four helicopter airscrews, and twin propellers astern. Like this. Do you believe him?



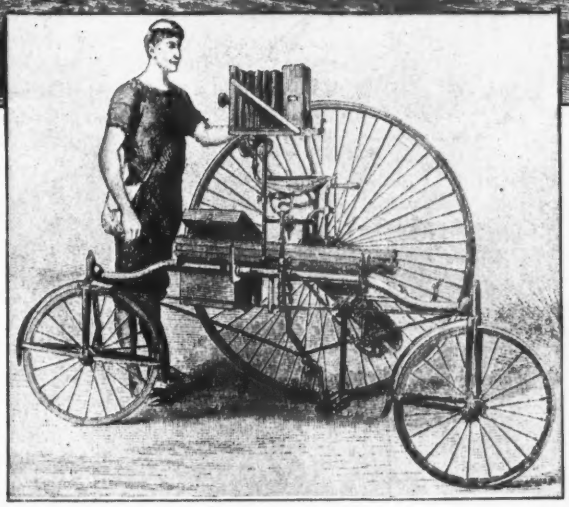
Here is the first aircraft carrier in history, the balloon-boat "G. W. Parke Custis," specially built in 1862 for the ascension of observation balloons employed by the North in the American Civil War.



Believe it or not, the thing at the right is a projected steam locomotive—the dream of a sun-happy Californian, 1876. The crafty man! How could any horse be afraid, meeting such a personable stranger upon the city streets?

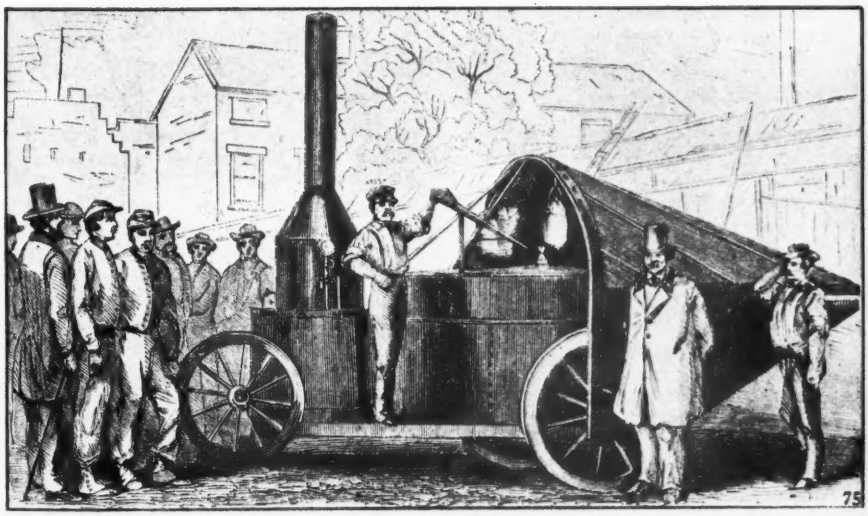


The Steam Catamaran was constructed by Commodore W. Voorhis and tried out during the years 1880-84. The raised structure and long floats were for fast progress in shallow water.



This photo fiend of 1888, having a mechanical turn of mind, mounted all his equipment on a tricycle. There have been thousands of photographic rig-ups, but this one is unique.

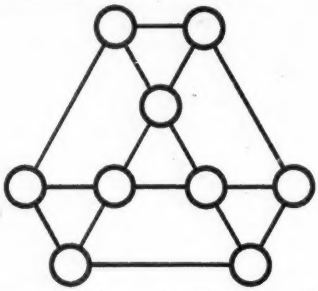
A steam gun used in the Civil War—first by the Confederates, then, after its capture, by the Federals. It was built to handle any missile from 1 ounce to 24 pounds, and could fire 500 balls a minute.



MI brain busters

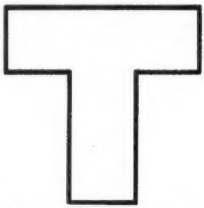
Batter your brains against these puzzles, Folks—and after a while, when you've regained consciousness, turn to Page 166 and see the answers.

1. Magic Number Arrangement



Can you distribute the digits 1 to 9, one in each circle, so that the sum of every three forming a connected triangle is the same?

2. Operating on the Square



Here is a rather squat T-square. Can you cut it into four pieces which can be put together without hollows or overlapping to form a square? There are several ways.

3. This Baaby Is Hard to Get

1 2 3 4 5 6 7 8 9 0

Can you arrange these ten digits in the form below so that the sum of the products indicated yields the current year?

```
OOO × O = ____
  OO × O =  ___
  OO × O =  ___
         ------
         1 9 4 6
```

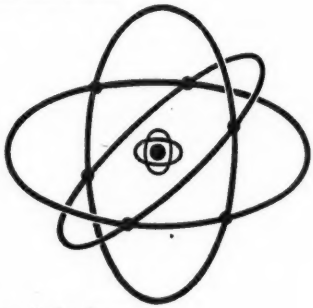
4. Cascade of Broken Nails

```
N A - - - - - - -   - - - - - - - I L
- N A - - - - - -   - - - - - - I L -
- - N A - - - - -   - - - - - I L - -
- - - N A - - - -   - - - - I L - - -
- - - - N A - - -   - - - I L - - - -
- - - - - N A - -   - - I L - - - - -
- - - - - - N A -   - I L - - - - - -
- - - - - - - N A   I L - - - - - - -
```

Here each dash represents a letter in a nine-letter word. Can you fill in these words from the definitions given below?

Sea traveler	Kind of type
Incapacity	Harmonize
Adulterated	Predominated
Written name	To make barren
Reverberation	Waver
Hundredth anniversary	Quiet
Pertaining to the belly	Assiduity
Occurrences	Lit

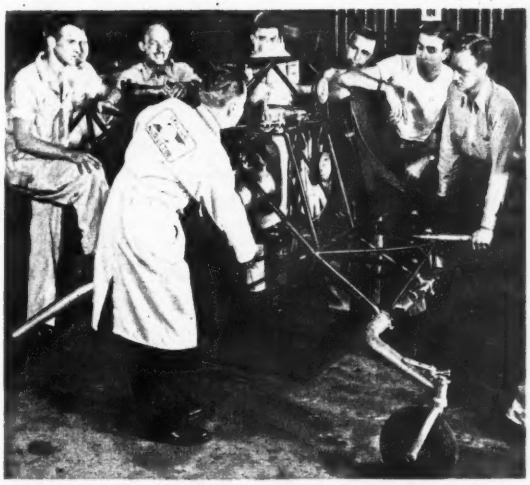
5. Circling the Atom



Only three of the large orbits are shown here.

We are told by the physicists that electrons revolve in orbits about the central nucleus of the atom. The oxygen atom has two small orbits and six larger orbits. (We shall not be concerned with the two small orbits.) If we suppose that the six larger orbits are circular, concentric, of the same size, and that no three pass through the same point, just how many points of intersection will the six circles have? Stop and think before you answer.

Pinwheel Alma Mater



BY C. B. COLBY

Pilots from all over the world are growing humming-bird wings at the 'Copter College.

The anti-torque prop keeps you from whirling around like a top, as the prof explains above. Left: Students ponder the helicopter's power plant.

IF YOU have a secret yen to fly up to the graduation platform and receive your "sheepskin" as you hover over prexy's head, the place to try it would be at the graduation exercises of the Bell Helicopter Flight Training School at Niagara Falls, New York.

This exclusive aviation school, under the able direction of Milo H. (for Helicopter?) Miller, is the only one of its kind in the world. Its student body is hand picked and selected not only for flying ability but with an eye to each individual student's potentialities as a future good will ambassador for the rotating wing industry during its anticipated growth.

Located at the Bell Aircraft Corporation's plant, this school which boasts of "classrooms with rotating roofs" is open to any selected pilot holding a CAA Commercial license and $1,500 he wants to invest in a bright future.

Many of the pinwheel graduates will be employed by the Bell company itself as pilots for various models of helicopters, while others will be employed by private helicopter owners, feeder lines, crop dusting and spraying organizations. For this reason it is a "must" that the students already hold CAA Commercial tickets.

The selection of the students, all other qualifications being equal, depends upon their character, integrity and interest in the future of helicopters. Applicants have sent in their requests for enrollment from practically all over the world. Sweden, Brazil, Chile, Canada, and even Egypt are represented.

Once selected—and the sending in of an application by no means guarantees that the applicant will be accepted by the Bell student selection board—the student begins a serious and highly complete six to eight weeks' course both in the classroom and in the cockpit.

The classroom work must be completed and absorbed in every detail as the student progresses. Such things as construction, theory of rotating wing flight, engines, torque effect, gyroscopic effect, methods of control, coning, flapping hinges and all other phases of helicopter flight are minutely covered. The progress and assimilation of the instruction is checked repeatedly as the class work progresses so that there may be no "cone of silence" in the student's knowledge of the helicopter's peculiar characteristics such as hanging in one spot like a humming bird.

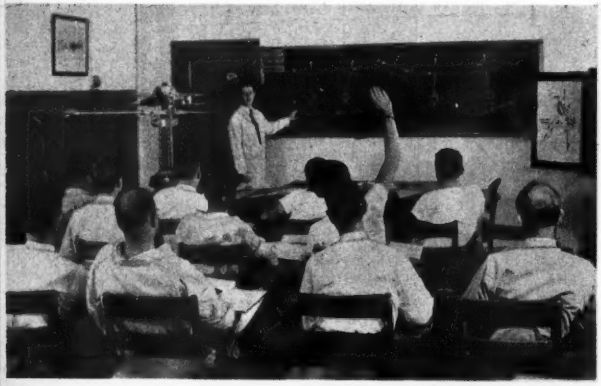
Once the classwork is over and the student knows every angle outside the cockpit, the flight training begins.

Under the expert direction of Chief Instructor Joe Dunne, who has flown well over 500 hours in helicopters, and Instructor Art Nelson, another veteran rotating wing pilot, the student begins the real thing.

First of all comes the "cockpit drill" to familiarize him with the controls and cockpit layout. This is important for there are instruments new to the pilot of conventional aircraft. Extra controls, new instruments and a stick-grip throttle, similar to a motorcycle throttle, must all be thoroughly understood and mastered.

The instruction helicopters are equipped with wide-angle, clear plastic bubble noses for maximum visibility, and of course dual controls.

Maximum visibility is doubly important in a helicopter, for a global sphere of flight demands that the pilot, particularly the student, be able to recognize instantly a change of direction and the speed of the change regardless of his altitude or surroundings. Flying along a few inches (yes, inches) above the ground at high speed, as may be safely done in a helicopter, requires perfect visibility and a well-



Students first learn of the strange bird in class, then meet him in person. Hmm . . . he has an honest, open face.

trained pilot, hence the design of the training ships and the thoroughness of instruction.

The flight instruction at the Bell school includes everything from one-spot hovering to spot landings by autorotation—dead engine and rotor blades revolving freely as a pinwheel. Jump takeoffs, rectangular patterns of flight, power glides, banked spiral climbs and glides, and simulated "high altitude" or overload landings and takeoffs are part of the curriculum. Nothing is left for the pilot to learn by himself. Even such things as icing, fire, hot and cold weather operation, power failure, tail rotor failure and ditching procedures are covered.

At present the classes are small by choice, four or five students to a class. This is in keeping with the Bell policy of individual attention and check on the student's progress. Students must show aptitude for rotating wing aircraft pilotage. Aspirants who do not possess or show this aptitude are eliminated during the first hours of the course and released from enrollment with a partial refund of the fees paid. Applicants must agree to complete the course, once accepted and started, for there is no half-way training in helicopter flight at the Bell school.

The subject-matter is covered in about 75 hours of classwork instruction, observation, and work in maintenance and servicing of the aircraft. Every modern means and training aid is used to clarify and aid in the work. Drawings, movies, mockups of full size scale models, electric motor-powered flying models and other media are liberally employed.

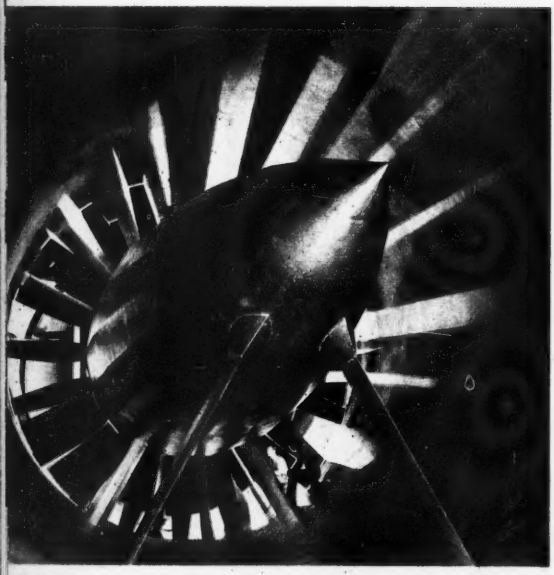
For those ex-service pilots who have attended Army, Navy or Coast Guard helicopter schools, the schedules have been condensed into a refresher and familiarization course. This course is shorter, 30 hours of class instruction as compared with 75 hours for the original course and 10 hours of flight training as compared with a maximum of 30 for the inexperienced pinwheel pilot, but it covers the same material. It is mainly a familiarization course to acquaint the ex-service pilot with the Bell machines and their servicing.

As in the full length course for the tyro helicopter pilot, the condensed course fee does not provide for living quarters, meals, or transportation to and from the plant. These must be arranged by the students themselves.

Coming in for a vertical landing after the first solo flight.

Transonic Wind Tunnel

The tunnel with its bulge; and at the left one of the eight 63-foot screens that iron out the rough airflow.



Looking upstream at the fans that drive air at such high speed through the tunnel.

AVIATION engineering has just been given a unique wind tunnel to help in the study of the problems of high-speed flight.

The Twelve-Foot, Low-Turbulence Pressure Wind Tunnel, as it is called by the NACA who completed it at Moffett Field, California, is capable of speeds up to that of sound—760 mph—and will permit scientists to secure design information applicable to full-size aircraft under most closely duplicated free-air conditions.

The test section is 12 feet in diameter; but by increasing the air pressure inside the tunnel to as high as six times atmospheric pressure, the data secured on models of 10-foot wing span are directly applicable to

This unique wind tunnel gives unparalleled smoothness of airflow at speeds ranging as high as the speed of sound.

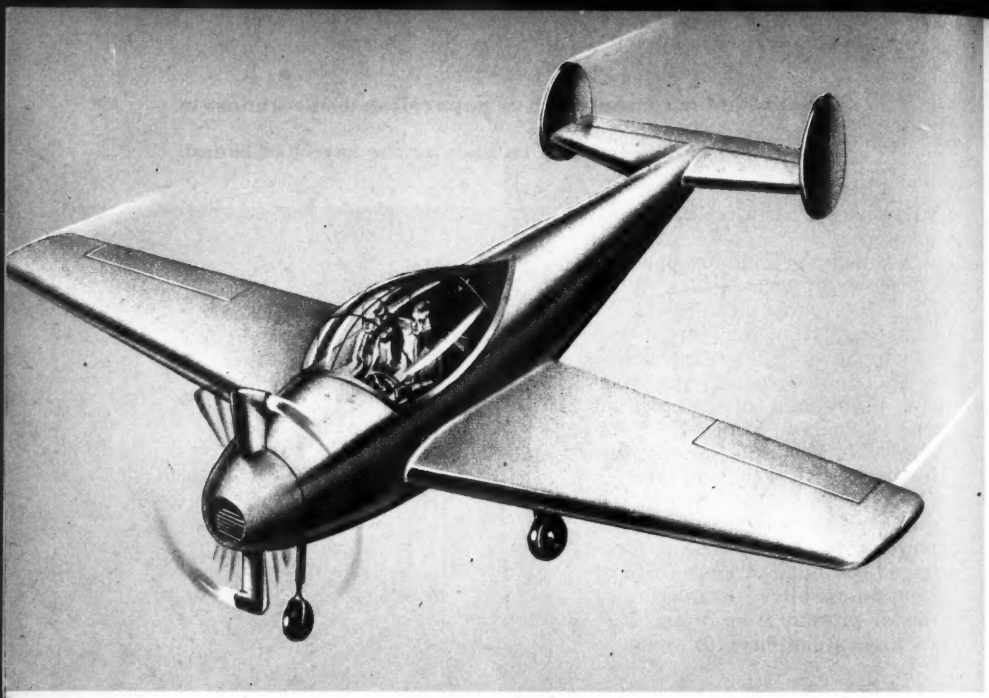
full-sized airplanes of 60-foot span.

A large bulge contains the secret of its low-turbulence airflow. Within it, spaced nine inches apart, are eight huge fine-meshed wire screens which "iron out" flow inequalities.

The tunnel has only one fixed and rigid point of support; all the rest floats on 52 pin-ended columns. It weighs 4,000 tons, and its support is earthquake proof.

Air is circulated by two 18-ton variable-pitch co-axial fans, powered by electric motors totaling 11,000 hp. Large centrifugal compressors allow the varying of the air pressure from one-sixth to six times atmospheric pressure.

Right, the model's support- and force-measurement devices, outside the tunnel test section. Below, part of a series of 15 sets of turning vanes that direct the air smoothly around the tunnel ends.



Jet Props for lightplanes

BY ED YULKE

A jet prop, a fuel line and a starter—that's the lightplane engine of the future.

JET engines right in the tips of the propeller! Fantastic? Not at all. The National Advisory Committee for Aeronautics is already studying three types which may radically change many aspects of aircraft design, especially of lightplanes.

The whole idea may be likened to the old-fashioned pin-wheel you used to nail to a tree on the Fourth of July; and at first glance it would seem to be just about as impractical. A powerful engine has always meant bulk and weight, so how could an engine possibly be located on a propeller tip?

The very simplicity of jet-propulsion is the answer. Furthermore, rather than being a bulky and clumsy affair the jet-prop will even have some design advantages over the common prop.

The long, thin blade of the conventional propeller has losses in thrust due to radial flow of air at the tips. The jet-prop, with its short, wide blades ending in the jet units, will have much lower tip losses. Air will not slip off the blade radially as in the conventional type.

As shown in the illustrations, the jets can be quite small. Fuel will flow to the jet through a line

in the hollow blade, although in one design the fuel is actually carried in the propeller tip! In the latter design, the fuel is in a jacket around the combustion chamber of the jet. As the fuel heats and expands, it is forced into the jet tube.

The big bugaboo to designers laying out lightplanes has always been the engine, the heaviest single unit of weight. The jet-propelled propeller would weigh only a little more than the conventional propeller. The saving in engine weight would be more than 80 per cent.

Jet props would save 80% in engine weight. Here's a neat NACA model.

In your jet-prop personal plane, a fuel pump and a starter is all you'll need in the engine department besides the prop. Instead of changing the rpm's for takeoff, cruising and landing, you may merely change the pitch of the propeller's blades. Probably most designs will place the jet-prop-engine in the rear, since the tongues of flame might be a bit unnerving whirling in a fury around the nose of the plane.

Fuel consumption of these new jet props may be a bit higher than for the conventional engines of equivalent horsepower, but this is entirely dependent on the design. Actually this slight increase will mean little in view of the overall weight saving.

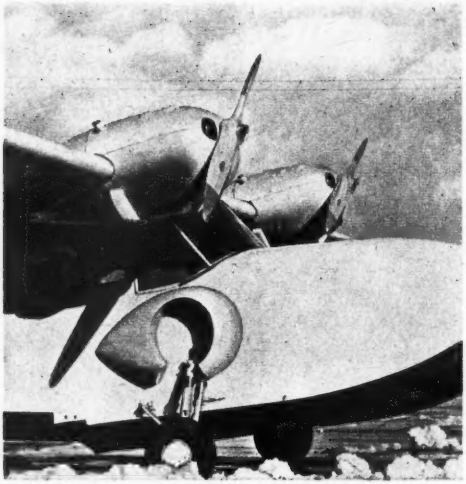
Of the three types of jet props proposed by the NACA Aircraft Research Laboratories in Cleveland, Ohio, the simplest according to design is the Areo-Thermal-Dynamic-Duct, or athodyd engine.

The athodyd needs no compressor or other moving parts such as a turbine to move the air. It is simply a tube varied in diameter to provide a slight compression of the air before fuel is injected into it and burned.

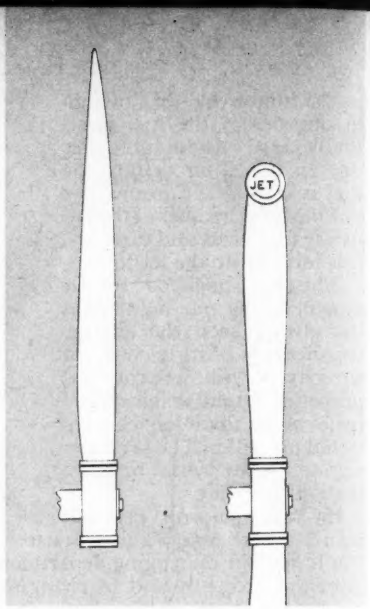
Open at both ends, it is similar to the "flying stovepipe" you've read about. Without moving parts except for the fuel being atomized into the combustion point of the tube, the only parts that would require servicing would be the fuel nozzle jets and the fuel pump. Fuel is fed to the prop-tip units through the blades.

Athodyds have always been considered unwieldy, since it was thought that they had to be placed in motion, or started by outside power. Recent General Electric Company tests resulted in findings that the athodyd jet proposed by Lorin, a Frenchman, in 1913 would develop a speed

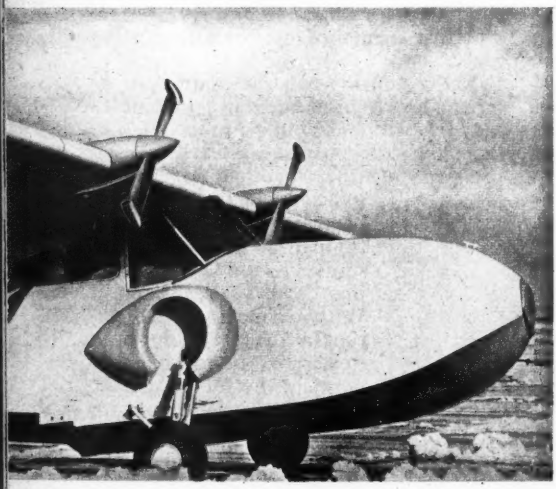
In a novel use of the jet principle, the helicopter above pipes its exhaust out one side of tail to prevent torque.



Look how much more visibility the Trimmer amphibian would have with jet props installed.



The jet prop would not lose thrust from loss of air at tips as does the conventional blade.



of 300 miles per hour, if given a starting speed of 290 mph. To say the least, this is entirely impractical.

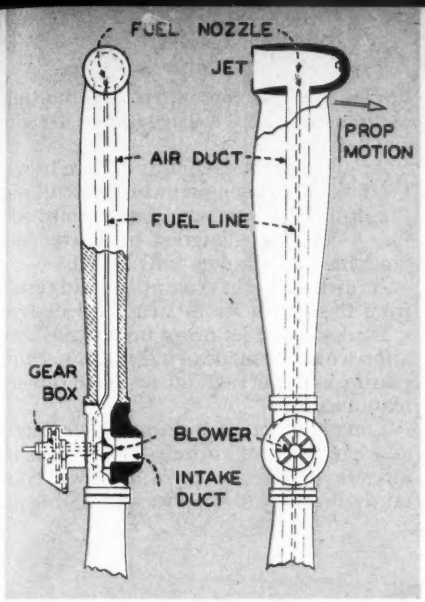
But information now available on some tests conducted by Zygmunt Fonberg, a Polish Rocket expert, with a "gasoline-blowtorch" like athodyd, tells a different story. Just as the latest rocket motors carry their fuel in a jacket surrounding the combustion chamber for preheating before actual ignition, Fonberg has jacketed his jet unit combustion chamber with a fuel chamber.

The result is that the heat from the combustion chamber expands the fuel, forcing it out through jets in the air duct, just like its gasoline blowtorch counterpart. Starting is accomplished by means of a piece of fuel-soaked cotton ignited and inserted into the leading edge of the duct to warm the fuel jet tube. Once the blast is started, the cotton is removed.

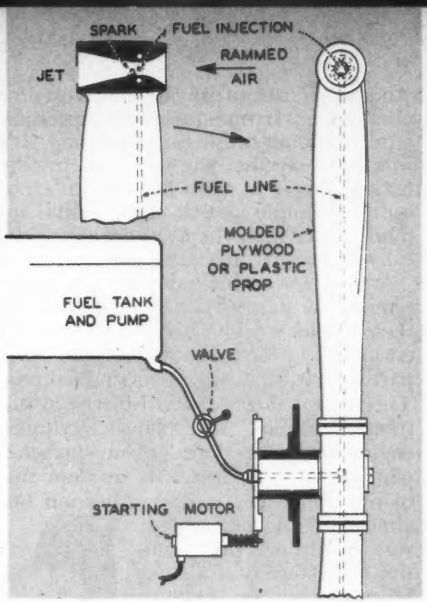
More practical for full-scale application would be an electrical heater unit around the jet fuel tube to preheat it and start combustion. Actual ignition may require an exposed glowing wire or spark plug.

Starting won't be a difficulty, however, since lightweight controllable pitch mechanisms are available. With jet propulsion units, it isn't practical to vary the speed of the "engines" as with the conventional power plants.

Abe Silverstein and the twin-brothers, Newell D. and John C. Saunders, who work under him, have suggested that the angle of the blades be varied rather than rpm's changed when different amounts of thrust are required for takeoff, cruising and landing. Starting would be done with the blades in zero-thrust position, or in other words, they'd just be slicing air. The greatly reduced drag at this position would enable a fairly normal-sized electric



This is the turbine type. Air enters the hub, is compressed, then goes to jet through hollow prop.



The ramjet idea made famous by the "flying stovepipe" is used in the athodyd jet prop shown above.

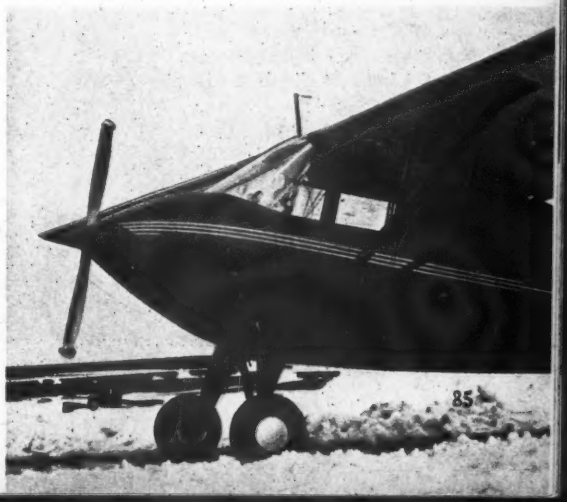
starting motor to rev the prop up to 2,000 or more rpm's.

The other two suggested types of jet-props utilize hollow blades for air supply to the blade-tip units, with the fuel traveling along the same passage in a tube. The first of these two types depends on the centrifugal force generated on the air moving out through the blades for compression to effect the jet operation. The other has a booster in the hub to aid compression and provide more effective jet combustion and thrust at the tips.

The centrifugal-force arrangement is much like the rotor of present-day turbo-superchargers where the air is thrown off the rotor and collected in a shell, to be delivered to the engine by ducts. In this type prop, the hollow blade whirling around acts as rotor and duct, the air being thrown directly into the jet chamber at the tip of the blade.

Compression of the air prior to the injection of fuel and combustion is necessary to efficient jet propulsion. The latter two types of jet props will undoubtedly be an accomplished, air-borne fact long before the athodyd type exists. Complex design experimentation will be necessary with the shape of the

The Skymaster in its present and possible future dress. Servicing would be a mechanic's dream.



athodyd jet tube to provide the thrust now obtainable from turbine-compression types without causing undue drag. It's simple to say that the tube can just be necked down in diameter, but it's not quite as simple as that. Drag builds up much faster than the compression as the tube is changed in shape.

While NACA does not design props or planes, the data obtained thus far from their studies is known to be of vital interest to every prop manufacturer and more particularly, the engine manufacturers. The jet prop might easily displace conventional "flat-four" and "flat-six" cylinder engines now so prevalent in personal planes. Aircraft designers are not discussing their activities for publication, but almost all of them admit studying the new prop's possibilities. Some of the possibilities offered by the prop for light plane design are shown in the accompanying sketches.

One reason the jet-prop-engines can be so easily mounted on the tail is their lightness in weight plus the important fact that they eliminate the difficult engineering problem of a shaft from the conventional engine to the prop. The latter was one of the principal bugs in the "mix-master."

Another great advantage of the tail-mounted jet prop is improvement made possible in fuselage design. The swayback effect required by the conventional pusher-type seaplane not only reduces strength of the hull structure but cuts down largely on the space available for cargo.

The accompanying illustrations show the conventional Republic Seabee with its necessary swayback, and below it the artist's conception of this plane designed for a jet-prop. In the latter, the swayback is replaced with a roomy cargo section which could be used for bunks, for packing sport or hunting equipment or as a baggage or freight compartment.

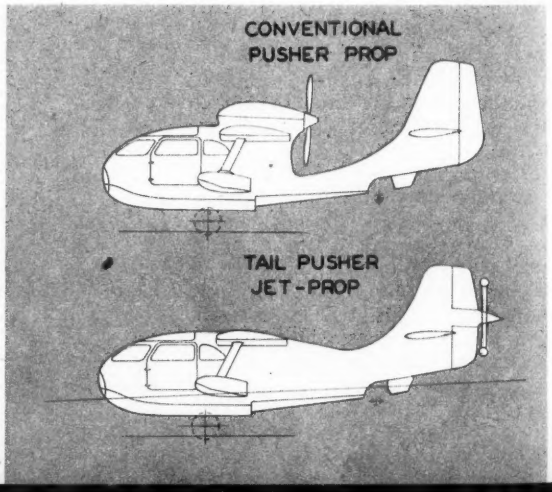
At present, the Republic Seabee uses a Franklin 212 hp engine which, including the propeller, weighs approximately 500 lbs. A jet prop designed to deliver the same hp would weigh only 105 lbs.

A further weight economy would result from the simplicity in structural design.

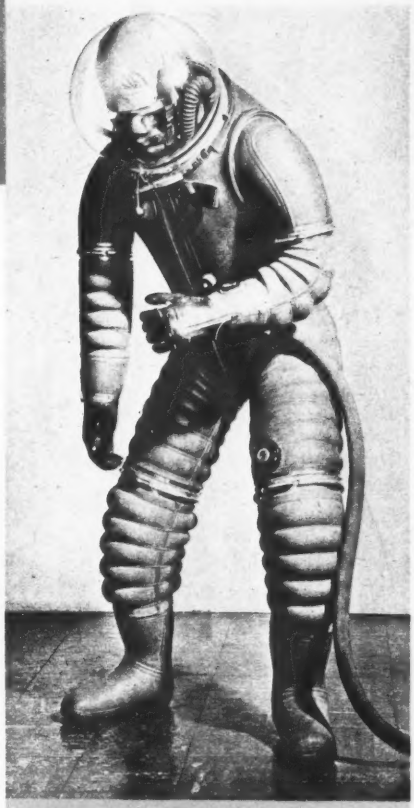
Blades of the jet props under consideration would be made of molded wood and plastic, with the fuel line installed during manufacture.

Long ago, jet propulsion was foreseen as a harbinger of entirely new designs in aircraft. Jet-driven propellers will certainly hasten the prophecy's fulfillment.

Weight-saving alone would give lightplane designers a new lease on life. Note below what a tail-mounted jet prop would do for swayback, pusher-type amphibs.



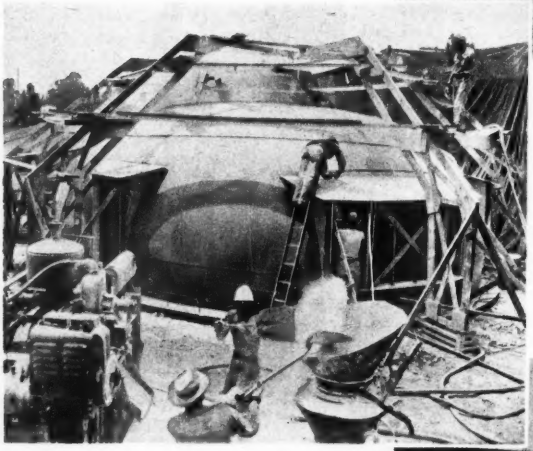
SCIENCE IN PICTURES



Modern Dress for the airman in this amazing age in which we live—the second year of the atom—is worn here by an Army Air Forces crew member. Designed to protect airmen from possible rupture of pressurized cabins, this pressure suit will support life even in a vacuum and will be used for high-altitude, supersonic flight. The new suit allows for complete mobility and is comparatively light in weight. It will undergo further research before being put into use, according to Brig. Gen. M. C. Grow.

Stratovision plane soars high over Maryland relaying television broadcasts, limited now to line-of-sight reception. If tests are successful, 14 relay planes would make national telecasting possible. (See "Television on Wings," MI, Dec. '45)

Sky Transfers were issued to these Greyhound passengers in an experiment to determine the practicability of an integrated bus and helicopter service. Greyhound plans a nationwide air-bus system as soon as equipment can be purchased.



Pumpkin-Shaped houses, built in two days by spraying concrete over an inflated rubberized balloon, are being offered veterans in Pasadena, Calif. After the concrete hardens on the "Airform" dwelling, the balloon is deflated and removed for use again.

Plastic Piano has tones like a harpsichord and a range of three octaves. Special alloy rods replace the usual strings and the plastic body acts as a sounding board. Invented by Harold Rhodes of Los Angeles, Calif., the instrument will be manufactured in that city by R. H. Osbrink, whose pretty, 18-year-old daughter Marian demonstrates the practical device at right.

REPUBLIC SEABEE

FAIRCHILD F24R

JOHNSON ROCKET 185

GRUMMAN WIDGEON

CULVER MODEL "V"

AERONCA CHAMPION

BEECHCRAFT D18S

CESSNA 140

ERCOUPE 415C

GLOSS SWIFT

WACO MODEL 8

STINSON VOYAGER 150

BELLANCA CRUISAIR SENIOR

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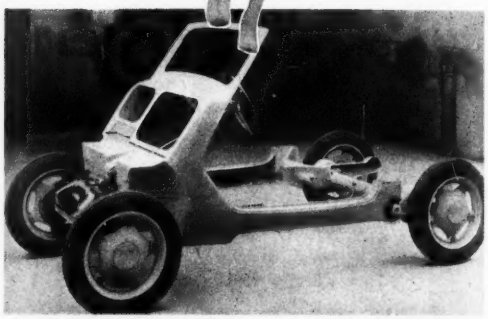
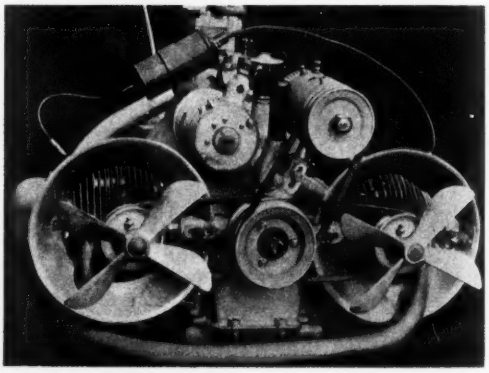
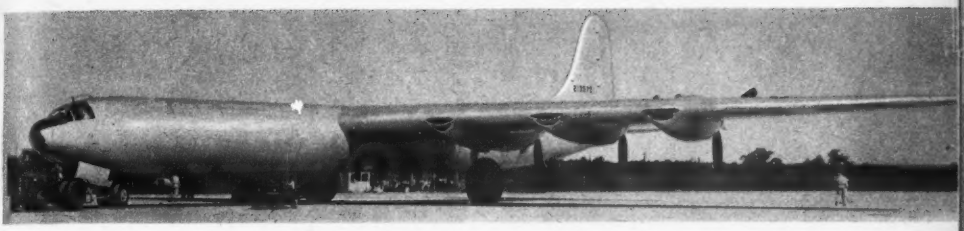
Henry Kaiser has purchased the American rights to this 800-pound French car, shown above, soon to be produced in Paris by Aluminum Francais. It has front-wheel drive, speeds up to 60 mph and goes 65 miles per gallon of gas. Called the "Gregoire," this French bid for the world's small-car market, has a cast aluminum body—shown at right—built around a frame made of light aluminum alloy. The air-cooled, horizontally opposed, flat twin engine—below—has a separate fan for each of the two cylinders. Designed in 1940 and first made secretly during the Nazi occupation, the car will also be sold in the British Empire.

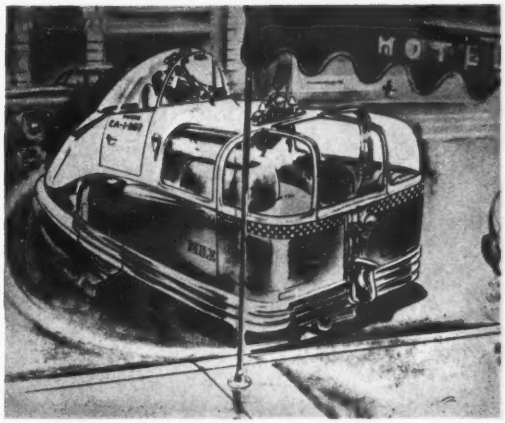




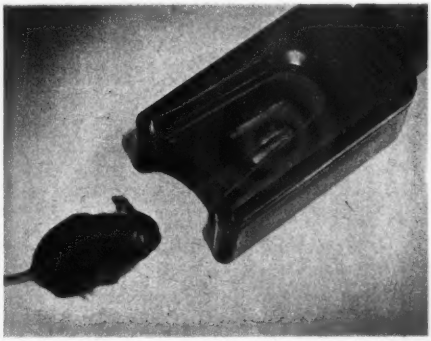
Sky Cradle is the latest thing for baby who has not been forgotten in this age of air travel. Large enough for tots up to two (over two, kiddies pay full fare and occupy adult seats), the cradle has a wide, plastic safety belt which zips across the tummy. Left: 13-months-old Susan Negaard and Gerry McGrail.

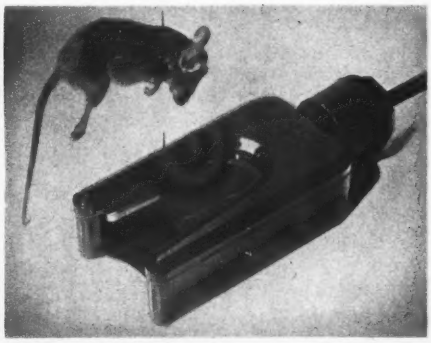


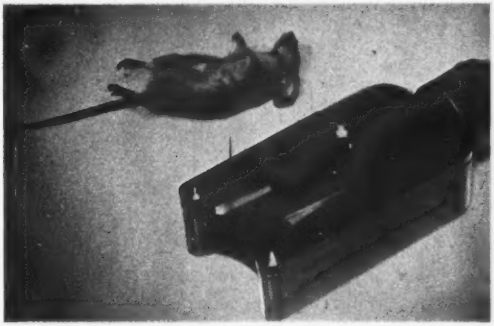
Biggest Bomber in the land-based class is the Consolidated-Vultee XB-36, now fully flight-tested. The sky colossus has six 3,000 hp, pusher-type engines, a wing spread of 230 feet and a 163-foot fuselage.



1950 Taxi? Commercial illustrator Radebaugh, of Detroit's New Center Studios, pictures his idea of the future taxi, at right. He says it could turn on a dime and seat seven passengers in a plastic "observatory."







Poor Mousie at right is the victim of the man who built a better mouse trap, an electric one. In these real life (and death) photos, mousie enters and is about to take a bite of cheese when—zowie!—an automatic switch turns the house current full on. His own muscular reaction throws him out. Makers are Ratchford Engineered Products Co., Dayton, Ohio.

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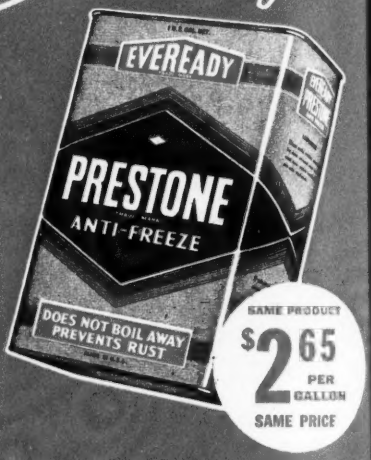

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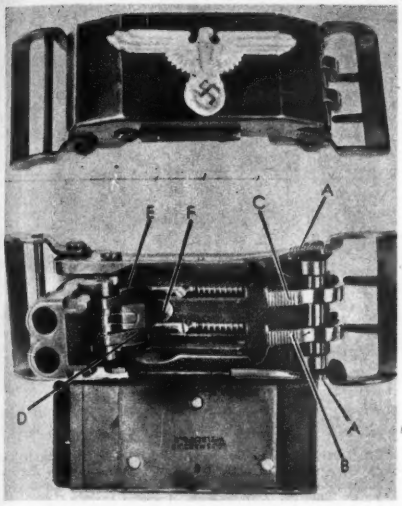
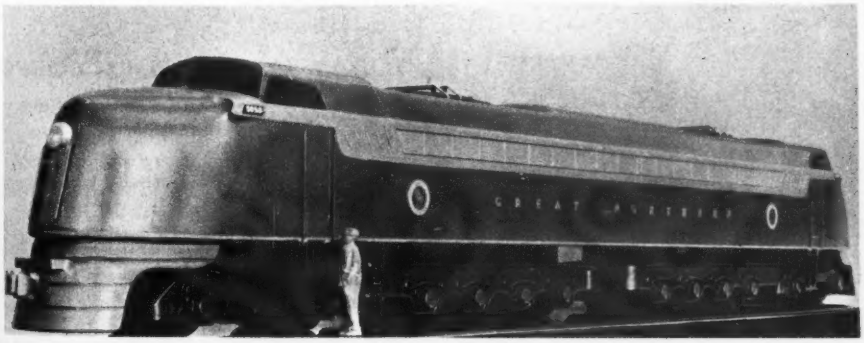
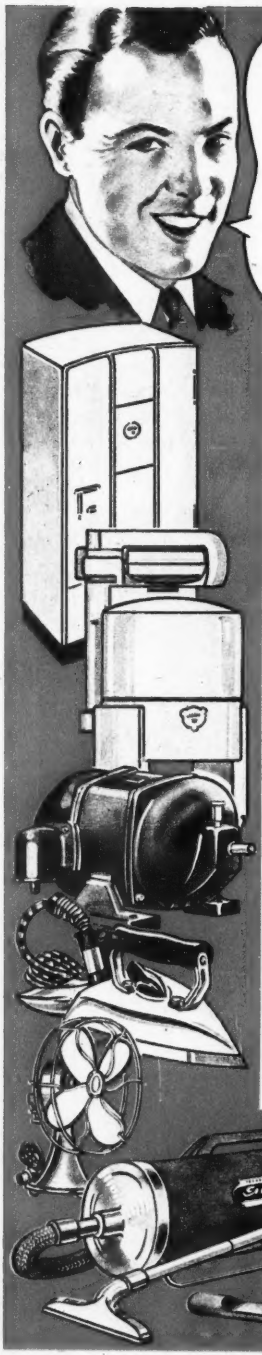


Belt Buckle Gun was another bizarre weapon created by the Nazis. When closed, as in the photo at top, it looks like an ordinary Wehrmacht belt buckle. But when the two levers, A-A, are pressed, the face flies open and triggers, B and C, fire the double 2-inch barrels. The gun is cocked and closed by lifting levers D and E over projection F.

New Twist on clinker removing was the result when Carl Anderson, garage owner of Bloomington, Ill., got tired of emptying his stokered furnace in the traditional manner. The scoop automatically follows the contour of the furnace and stoker retort, he says.

World's Largest single cab electric locomotive will soon be delivered to the Great Northern Railway by General Electric. Designed and built by GE's Erie plant according to the model below, the new power plants are 101 feet long and develop 5,000 hp. They will cost about $500,000 each.





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I have received your Course in Appliance Repairing and I must say I am well pleased with same. I am only sorry I did not have said Course some years ago. I have learned so much more through this course I would not part with it.—Charles Schwarz, Hamilton, Ohio.

The Course in Appliance Servicing arrived a few days ago. Want to take out a few minutes of my valuable time to let you know that this is just what I have been looking for ever since I opened up my Fix-It shop. I must admit that you told the truth when you said that it contains quite a bit more information than I bargained for.—P. J. Breti, Sebring, Ohio.

I am a mechanic for the Western Union Telegraph Co. Three days after receiving the lessons in refrigeration I earned the exact cost of the course.—Henry S. Lee, Washington, D. C.

I work day times at the shipyard and after 4:00 P.M. I operate from my cellar and garage. I average $10.00 to $15.00 clear every day.—Walter Hanby, Brockton, Mass.

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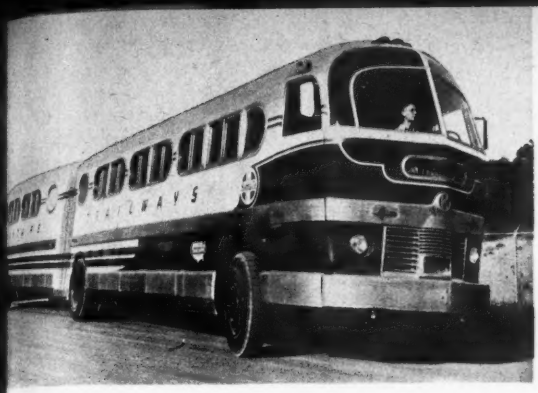
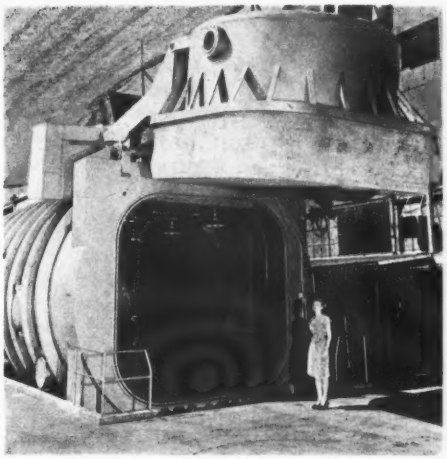


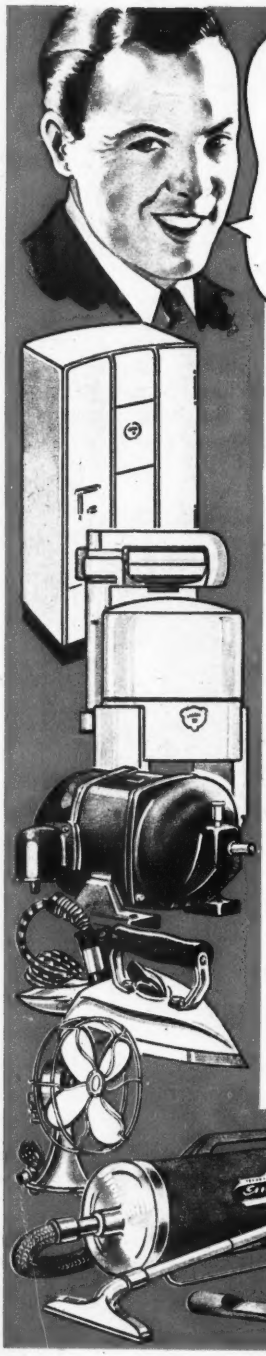
Super Bus at left was the result when Henry J. Kaiser, ship and auto building genius, got to work on the transportation problem. First shown at Kaiser's Permanente, Calif., magnesium plant, the luxury liner is 60 feet long and is made almost entirely of magnesium-aluminum. Many believe it will revolutionize highway cross-country travel.

Heavy, Heavy hangs over thy head, Miss Mary Stahlman. The door, under which this California beauty stands so trustingly, weighs 21 tons. It is counter-balanced, however, so she's in no danger. The 12-foot covering opens and closes on North American Aviation's new altitude chamber which tests men and materials in temperatures from 100 below to 200 degrees Fahrenheit above.



Curling Cord which coils itself into the correct length when in use, is demonstrated by Miss Virginia Gaugel of Chicago. The new type ironing and appliance cord was first shown at the American Furniture Mart in the Windy City. While the cord has the appearance of a spring, it causes no tension even when the iron is at the far end of the board, Miss Gaugel reported after a practical test of the new appliance.

Prefabricated piano at right is the invention of Charles Frederick Stein shown assembling the instrument with the decorative assistance of Miss Carolyn Betz. Eliminating moving and storage problems, the piano can be put together by one man and made ready to play within a few minutes after delivery. Pratt, Read and Co., Inc., Ivoryton, Conn., is the manufacturer.



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Read What Our Students Say About Course

I really believe your course the best investment a mechanically minded man can make.—Claude E. Allen, Indianapolis, Ind.

I have received your Course in Appliance Repairing and I must say I am well pleased with same. I am only sorry I did not have said Course some years ago. I have learned so much more through this course I would not part with it.—Charles Schwarz, Hamilton, Ohio.

The Course in Appliance Servicing arrived a few days ago. Want to take out a few minutes of my valuable time to let you know that this is just what I have been looking for ever since I opened up my Fix-It shop. I must admit that you told the truth when you said that it contains quite a bit more information than I bargained for.—P. J. Bretl, Sebring, Ohio.

I am a mechanic for the Western Union Telegraph Co. Three days after receiving the lessons in refrigeration I earned the exact cost of the course.—Henry S. Lee, Washington, D. C.

I work day times at the shipyard and after 4:00 P.M. I operate from my cellar and garage. I average $10.00 to $15.00 clear every day.—Walter Hanby, Brockton, Mass.

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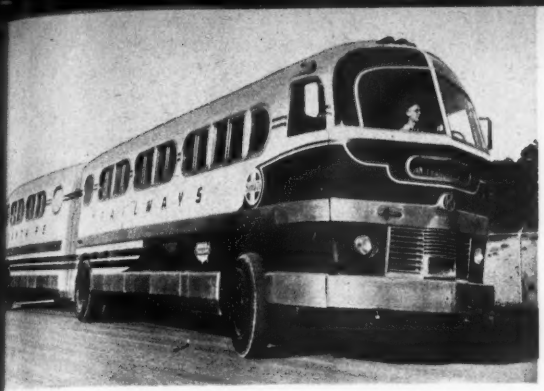
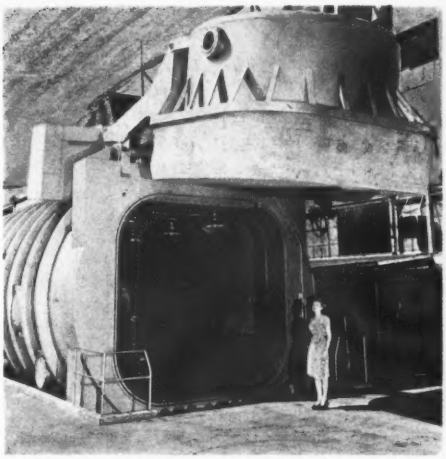


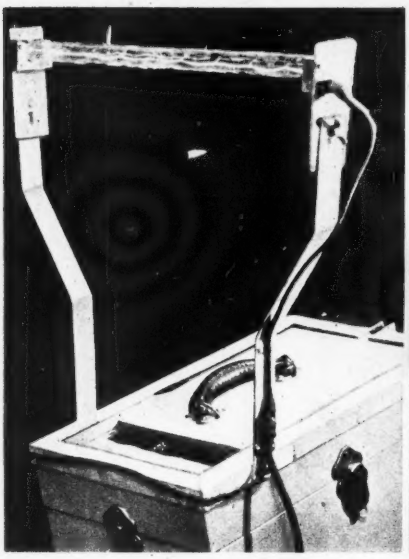
Super Bus at left was the result when Henry J. Kaiser, ship and auto building genius, got to work on the transportation problem. First shown at Kaiser's Permanente, Calif., magnesium plant, the luxury liner is 60 feet long and is made almost entirely of magnesium-aluminum. Many believe it will revolutionize highway cross-country travel.

Heavy, Heavy hangs over thy head, Miss Mary Stahlman. The door, under which this California beauty stands so trustingly, weighs 21 tons. It is counter-balanced, however, so she's in no danger. The 12-foot covering opens and closes on North American Aviation's new altitude chamber which tests men and materials in temperatures from 100 below to 200 degrees Fahrenheit above.

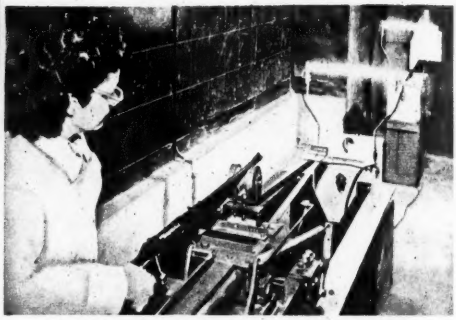


Curling Cord which coils itself into the correct length when in use, is demonstrated by Miss Virginia Gaugel of Chicago. The new type ironing and appliance cord was first shown at the American Furniture Mart in the Windy City. While the cord has the appearance of a spring, it causes no tension even when the iron is at the far end of the board, Miss Gaugel reported after a practical test of the new appliance.

Prefabricated piano at right is the invention of Charles Frederick Stein shown assembling the instrument with the decorative assistance of Miss Carolyn Betz. Eliminating moving and storage problems, the piano can be put together by one man and made ready to play within a few minutes after delivery. Pratt, Read and Co., Inc., Ivoryton, Conn., is the manufacturer.

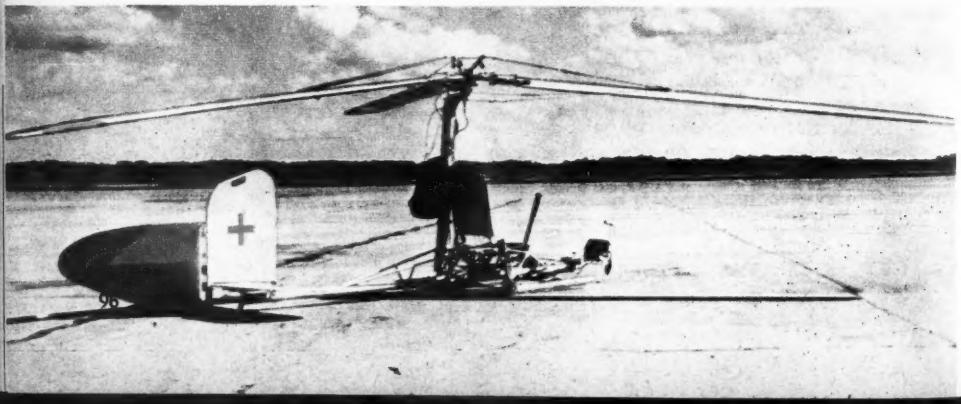


Caught In Mid-Air. that white object at left is a 30-06 bullet fired from a Winchester Model 70 rifle. It was snapped at 4/1,000,000th of a second as it passed over the photoelectric chronograph. This super-stopwatch is used by the Western Cartridge Co., East Alton, Ill., to make accuracy-velocity tests.



Body Armor of glass cloth is a part of this life jacket which makes it bullet proof. Protection against enemies who fire at survivors, the plastic-treated vests are being tested by the Navy. Here, Lt. Comdr. Andrew P. Webster pretends to fire at Frederick Lamont, S 1/C, of Trenton, N. J.

Kite 'Copter below was carried aboard a Nazi submarine and used to make observations at sea. This is the first picture of the motorless craft, though details were released earlier by the U. S. Navy. (See "Gyro Cars For Fun," MI, Nov. '45.)



With use of the proportionate calipers the helmet of the model is reproduced at double its size.

Artist of the water world

BY WILLIAM A. BURNS, American Museum of Natural History

Olsen brings the floor of the ocean to the floor of the Museum — painting, collecting, re-creating.

MANY an artist, painting in a field, has been chased by an angry bull—but how would you like to be down on the ocean floor and have moray eels, sharks or barracudas peeking over your shoulder while you are painting the local scene? Chris Olsen—artist, modeller and sculptor in the American Museum of Natural History—takes such visitors as part of his daily work.

Mr. Olsen's job, when he is not making accessories for undersea groups in the Hall of Ocean Life, is to go down under the surface of the sea with his paints and make working sketches of marine life. The sea groups depend on these sketches for their startling accuracy.

Olsen's early boyhood was spent in Copenhagen, Denmark. His father wanted him to be an artist but he had ideas of his own.

"Artists," he says, in a voice that still bears a faint trace of a Danish accent, "all paint the same things—trees, flowers, skies, hills—no difference, nothing new to try"—so he took up sculpture, feeling that three dimensions offered him more outlet for his talents than did painting. He did take lessons in marine painting from the famous artist, Pritchard, however, and later on this was to be of great value to him.

When he came to America he found employment in modelling and sculpturing. His hobby was, and is, insects and he liked to make wax models of them, enlarged many times. One day he showed some of his models to the late Dr. Frank Lutz, of the Museum's Insect Department. Dr. Lutz was so impressed with the accuracy of the work that he persuaded the young artist to come and work at the Museum, although he already had a good job.

Later Olsen found himself working with Dr. Roy Waldo Miner, then Curator of Living Invertebrates, and while on one of the expeditions to study undersea life he had an opportunity to go down several fathoms in a diving helmet. He was fascinated by the trip. His artistic imagination was stirred by the strange light, the waving fronds and the beautiful and unearthly color combinations he found in life on the reefs of the Bahamas.

"This," he said, "is something new," and he then and there decided to devise a method of painting under water.

Ordinary artist's materials would not do, he found. He tried to use the conventional brushes, palettes, mounted canvas and wooden easel of the land artist, but they'd float away before he could lay a line of paint. So, first, he invented a "canvas" made of muslin stretched tightly over heavy plate glass, then impregnated with white lead. This made an ideal surface on which to paint under water.

His next problem was that of applying the oil colors to the canvas. Brush-work under water, he decided, could not be very satisfactory so he trained himself to paint with a palette knife. This is not a new painting technique but he found it very well adapted to the peculiar conditions under the surface.

Olsen made his palette out of monel metal, which would not rust or corrode in salt water. He prepared his colors and spread them on the palette before he put on his diving helmet and went down. This eliminated the need of carrying any extra equipment in the form of paint tubes. His easel he made of teakwood; he

This stone crab will be placed in an attitude of attack near the diver in the completed Sponge Reef.

found it handled better than a heavy one made of monel.

With his palette prepared and all of his equipment tied to him he then put on a diving helmet and descended to paint the scenes he found below. He wore only a bathing suit and a pair of sneakers. Some men who paint under water wear dark clothing that covers their entire body, even putting dark gloves on their hands, on the theory that this prevents sharks and barracudas from being attracted by the white areas of exposed flesh; but Olsen has stuck to his bathing suit, sneakers and diving helmet.

The job of painting under the sea presents difficulties that the land artist does not have to contend with. First, you can stay under for only about thirty minutes at a time. Again, the deeper you go, the more trouble you have with breathing and moving around. Last, but decidedly not least, there are kibitzers under the surface that are more distracting than summer campers or farmer's bulls.

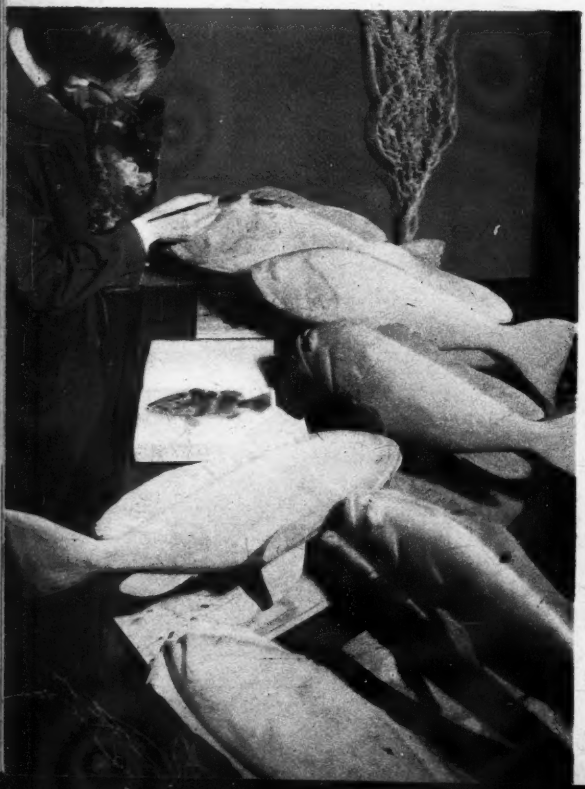
Olsen tells of some of his undersea adventures. "I used to carry a shark knife, a special knife that screws into an oil-filled sheath to keep the blade from rusting. But before you can unscrew the knife after you sight a shark he has either gone away or has bitten your head off. I carried the knife for the first few times, then left it 'upstairs' for good."

A moray eel gave Olsen a close shave one day. While moving about on the

Olsen hangs a few fish in tentative position over the steel framework of a diorama.

At work on a color sketch of a white grunt, for use, later, in finishing a whole school.

Olsen touches up the background of the famous Pearl Divers group.



Painting the mottling on one of the groupers for the Sponge Reef.

Fastening a delicate wire to one of the small "swimming" reef fish.

sea bottom he passed close to a crevice in the coral. The dark opening gave no hint of what might lurk within until, suddenly, a vicious moray eel lunged out at him, narrowly missing him with its needle teeth. He moved out of that neighborhood in a hurry. The bite of the moray is particularly bad in that it takes out a chunk of flesh with its teeth and may poison the wound because of food on which it might have been feeding.

Barracudas have often given Olsen a "turn." When these slim torpedo-shaped tigers of the sea flash by four or five feet over his head, he stands motionless until they are gone. Sharks do not bother him too much because they are "nervous" when near reefs and they tend to shy away from the unwonted sight of a human painter standing on the bottom. In deeper water, where they are "at home," they may present a more serious problem.

Olsen does his undersea painting with a palette knife, not a brush.

This very grouchy looking fish is getting a final touching up.

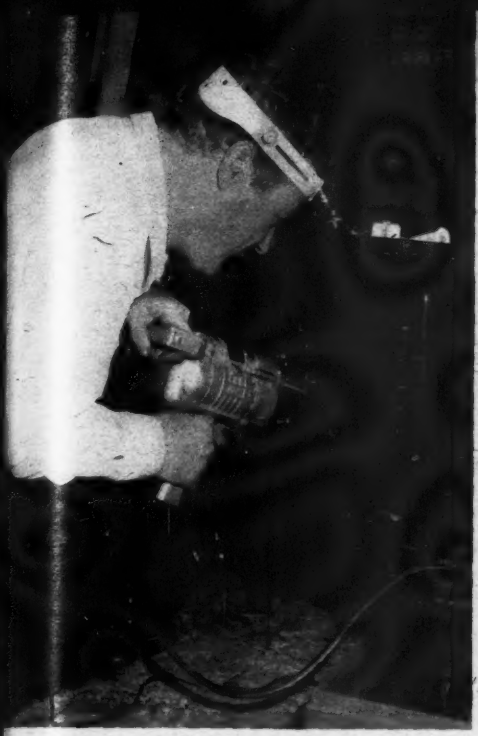
Photos by Leeser, Camera Clix

Eads frequently goes to the job in his station wagon-locksmith shop. It is NOT possible to open a safe in the way he pictures below.

SAFE MAN

THE legend of Jimmy Valentine has been exploded, and "Red" Eads, Hollywood's master locksmith, whose reputation reaches as far as Winnipeg and Mexico City, is one of those responsible. Summoned daily to open or repair safes for burglarized industrial firms, or to solve safe-cracking cases for insurance companies, private individuals and the police, Eads has had plenty of chances to try out the time-hallowed Valentine method of sandpapered fingertips.

"It just doesn't work," Eads

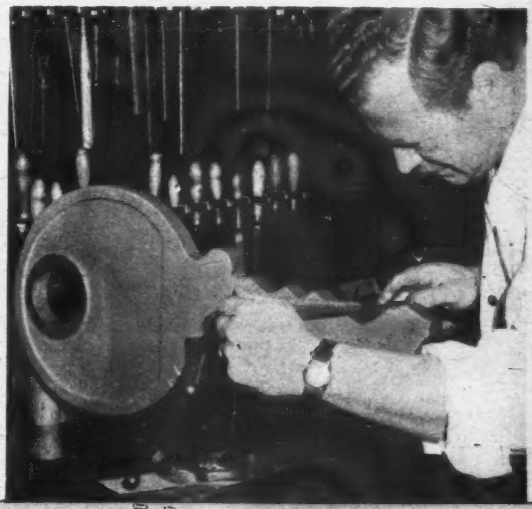


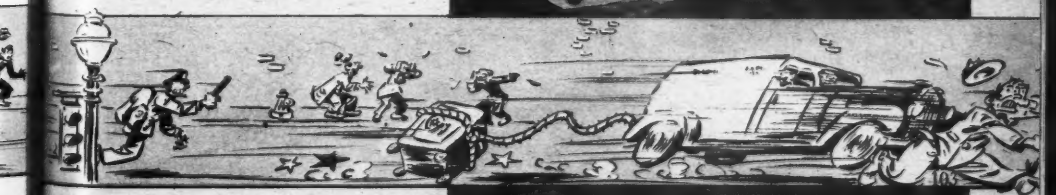
Eads can open most safes by trying for the combination; stubborn ones must be drilled.

A model of his "panic lock." You break the glass, touch the lock, and the door opens. Below, a "gag" key for a movie production.

says. Raw fingertips would only hinder. Nothing but knowledge of the workings of the various safe locks and their possible combination numbers will ever help a locksmith to open a safe.

Other methods fixed in the public mind, such as trying the safe tumbler with a needle held in one's teeth, are likewise unadulterated baloney, Eads says. Baloney too is the idea often used in fiction stories, that the government or police call on expert safe-crackers in prison to solve especially tough safe-opening prob- [*Continued on page* 162]





Airliner DeLuxe

Superfort's "big brother" is the post-war Stratocruiser.

PRESENTED here are the first interior shots of a full size model of the coming Boeing Stratocruiser transport airliner.

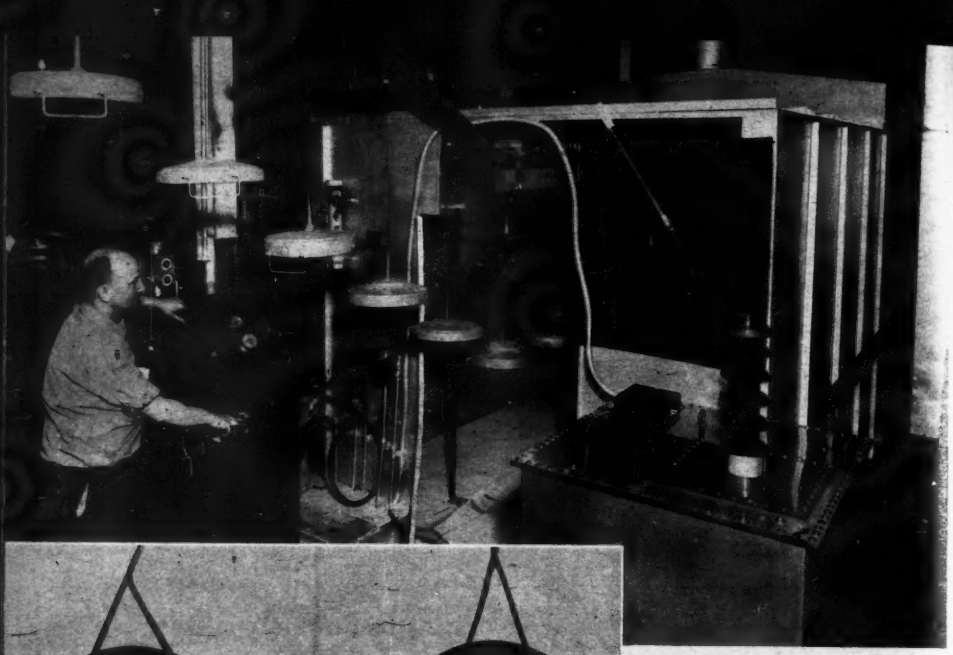
The big plane is a "blood brother" of Boeing's famous B-29 and incorporates all its aerodynamic advancements. It will carry 81 passengers—or a payload of 39,000 pounds—at speeds close to 400 mph.

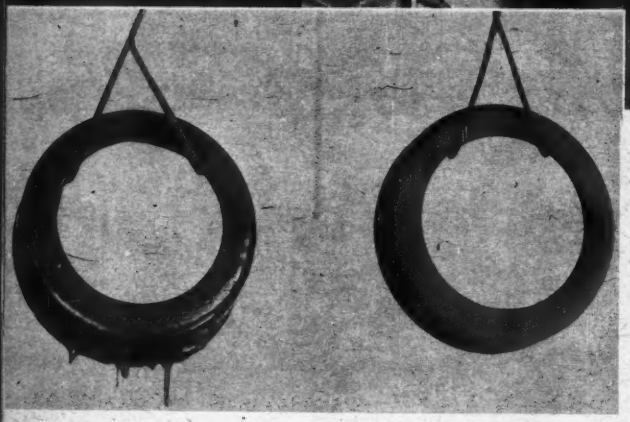
At the flick of a finger the stewardess can talk to any part of the great ship.

Color photos, courtesy of Boeing Aircraft Co.

A lucky gal is any stewardess who serves from a "heavenly" galley like this.

Time is all-important! These twin doors speed loading and unloading.





Automatic paint spraying in an electrostatic field (top). Both the rings have been dipped, but only the right one has been electrostatically deteared.

Magnetic Painting

PAINTING can now be done magnetically.

The article to be painted is carried on a conveyor line into a booth where an electrostatic field has been set up through the use of vertical electrodes charged with 30,000 volts of electricity and located within range of a spraygun. The article is grounded through its conveyor hook. As the paint is sprayed into the area its particles are instantly charged and attracted to the surface to be covered.

No paint gets past the article and escapes.

The magnetic principle also can be used to remove excess paint (wet). An electrified grid just tears it away.

Excess paint being magnetically pulled from the article in thin streams.

Mechanix Illustrated

Glass Quonset

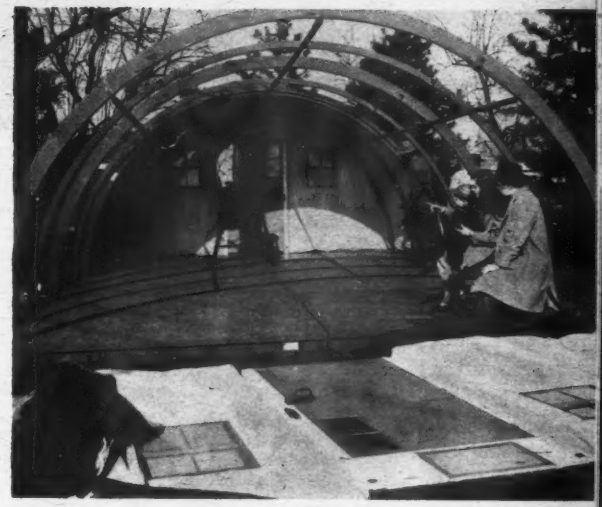
HERE'S a new portable house, a quonset in shape but with a covering of glass. The framework is aluminum. Over it are hung walls and roof composed of blanketlike sections consisting of an inner and outer surface of coated Fiberglas insulation of the type used during the war in our bombers.

The front and back consist of similar blanketlike sections, each with a door and two windows. A similarly insulated floor can also be provided.

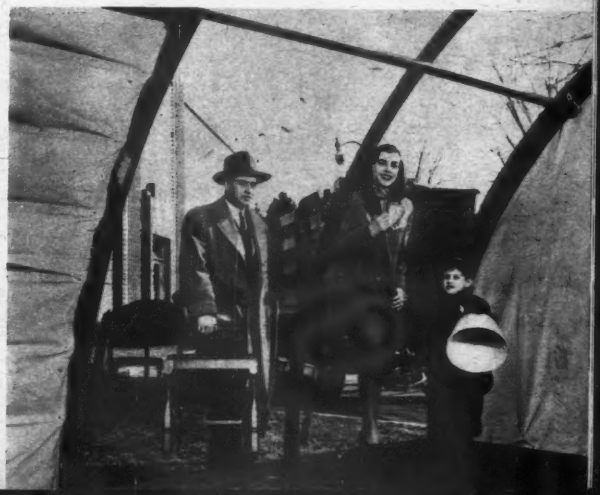
The Fiberglas is fireproof and highly sound absorbent, and it provides excellent heat insulation. It helps keep down high temperatures in summer, and in winter, with a small heater, maintains comfort even under below-zero weather.

It is expected that houses of this type will be in urgent demand from veterans and the many others who must have some place to live until they can build or find permanent homes.

The houses are 16 by 24 feet, and can be erected in two hours by four men equipped only with hammers and pliers. They are of the type used during the war by the Army Air Forces in tropical and Arctic climates.



The new portable glass house is put up quickly. Half an hour after choosing the site this family is deciding on the arrangement of their furniture: one hour more and they're beginning to move in!

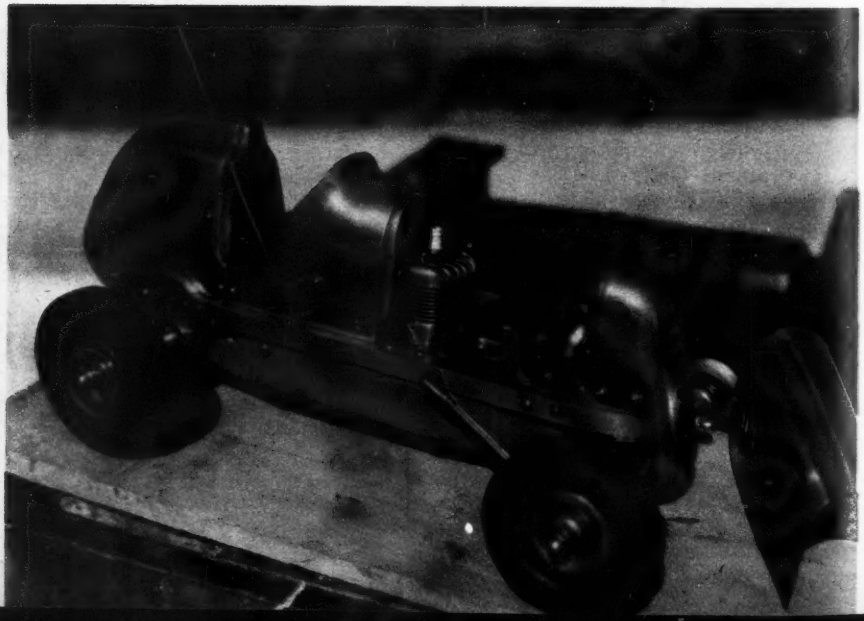


Midget Midgets

Two Prototypes and a Spur Gear-class car, tuned up and rarin for action.

BY BOB DUNKLY, Secretary, American Miniature Racing Car Assn.

Miniature race cars are becoming as popular as they're fast—and top speed to date is 116 mph!



Photos by Julius Fanto

To date, some 400 racing clubs with an aggregate membership of 15,000 are actively engaged in the hobby. The result is noteworthy; speed has been pushed up from the 20-odd miles per hour record of 1938 to the present top of 116 miles!

After their run the cars are stopped by knocking back the ignition switch arm. The car seen above is an early Dooling.

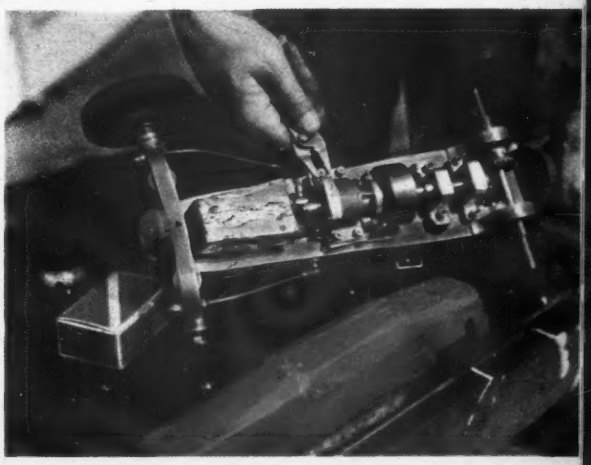
RAPIDLY surpassing their pre-war popularity, miniature race cars are again making their bid for the number one position in the model field.

Many consider these cars the proving ground for the model internal-combustion engine. Well they may. The lust for speed during the past few years has brought the perfection of these precision power plants to a point where they develop more horsepower per pound of weight than any other reciprocating engine in the world today. It is quite common for a five-ounce "hot iron" of 10 cubic centimeters' piston displacement to develop in excess of 1¼ horsepower at between 20,000 and 22,000 revolutions per minute!

The small cars which these engines power resemble in most cases the larger man-carrying racing automobiles. Engineered for speed, the models are designed to meet the standards and specifications established by the American Miniature Racing Car Association, the recognized national governing body of model car competition.

Ignition on, fuel tank full, a good push for a quarter of a lap—and the engine starts to roar.

With oil pan off, simple all-metal construction is revealed. Note engine flywheel, bevel-gear drive.



Left: This Hornet-powered Dooling, one of the first cars to be marketed, can still hit 90 mph. Switch is on right.

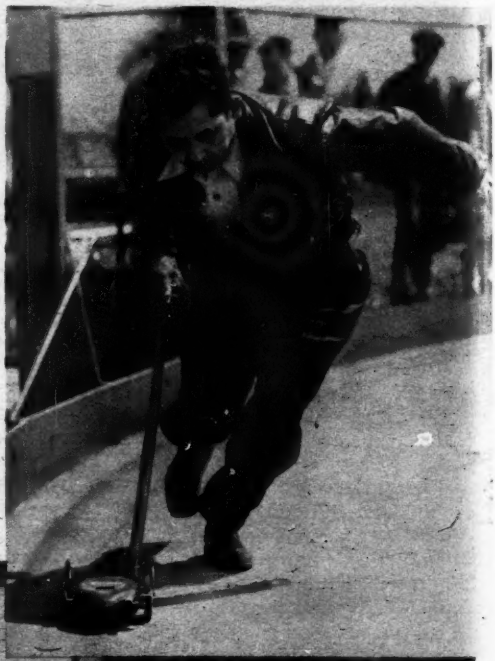
The cars are grouped in three categories. First is the Conventional or Prototype class, containing replicas of the large man-carrying racers. Second is the Streamlined class, for cars not having an open cockpit but resembling the specially-designed speed cars, such as Sir Malcolm Campbell's Bluebird. In both these classes the power is transmitted to the driving wheels through right angle or bevel gears. The third class, called the Spur Gear, is for cars completely streamlined and driven through spur gears.

Although a great many of the fastest cars today are of original design, fast cars are also available from a few manufacturers. These cars, along with a good assortment of "hot" engines, can be purchased from most hobby shops.

On the track, each car makes its circular run by itself, racing against time. In order to eliminate the possibility of human error in clocking, all tracks are equipped with some type of electric timing device operated either through photoelectric cells or an electric contact switch located on the center post.

A track represents a several hundred dollar investment, so the sport is strictly for men.

Newcomers desiring additional information and reference to a nearby club may write to the author in care of this magazine.



Top photo, Elton Winchell of Detroit and his Prototype car. Right, getting a Spur Gear "fish" under way. Below, the Detroit club and some of their cars.

TORPEDO

BY ORRIN WRIGHT

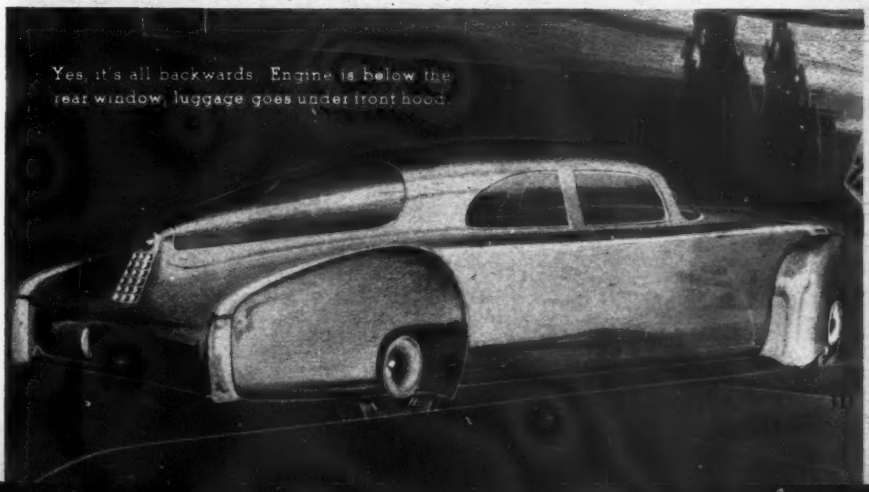
You steer from the center and cruise at 100 in this new rear-powered car.

DAREDEVIL speeds of yesterday will be only moderate Sunday afternoon clips to tomorrow's conservative driver in the new passenger car designed by Preston Tucker, nationally-known engineer and race car builder.

Tucker calls his new creation the "Torpedo." It is designed to cruise with safety at 100 miles per hour and has many features never before built into a passenger automobile.

Among the Torpedo's most unusual features are center steering, fenders and front wheels mounted as units so that the fenders turn with the wheels, rear engine with "torque converter" power transmission, disk-type brakes and a sealed cooling system.

The torque converter, which the designer says is the key to successful use of the engine in the rear, eliminates gear transmission and differential altogether.



Yes, it's all backwards. Engine is below the rear window, luggage goes under front hood.

Rear axles, which carry no weight, go direct from engine to wheels through aluminum castings which provide independent wheel suspension. The only controls on the floorboard are the foot throttle and the brake pedal.

The frame is designed of welded steel tubing, fabricated in a manner similar to that of an airplane fuselage. The overall weight of the car is 2,000 pounds.

The sealed cooling system operates under forced circulation, thermostatically controlled. In winter, a part of the radiator heats the interior of the car.

The Torpedo has a fuel injection motor similar to those used in airplanes. Direct injection reduces idling speed and boosts power, Tucker claims.

The block is a single aluminum casting combining the cylinder and water jacket. The pistons are of aluminum of the same coefficient of expansion, which reduces ring wear and prolongs engine life.

The Torpedo has three headlights. Two are mounted in the fenders and swing with the wheels. The third is in the center and stays fixed straight ahead. A photoelectric cell automatically dims the lights when another car approaches.

Tucker's reason for mounting the steering wheel in the center is that his racing experience has shown that a fast moving vehicle cannot be properly controlled with a side steering wheel.

As another measure of safety, he has installed throttle controls which hold the speed down until new drivers, unaccustomed to rear-engine power, learn how to judge speed accurately.

Three sit in front. Individual side seats swivel out of driver's way as doors open.

UTILITY End Table

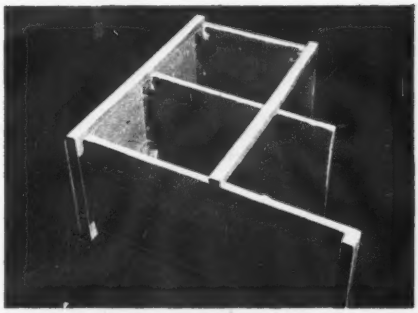
crafts and hobbies

HERE'S a good looking, useful end table that you can make for a few cents' investment with a minimum of tools. Only a saw, screwdriver and sandpaper are required. The table (you can make them in pairs, left and right) is designed for living room, bedroom or den. Two of them can be used at the ends of day bed or couch, alongside your bed, or back-to-back against the wall. The three shelves will hold an amazing amount of books, ashtrays, bric-a-brac, magazines and assorted odds and ends.

Use redwood, pine, whitewood, or any other available lumber. Chances are you'll want to paint them anyway, so it doesn't matter much. You'll need 6½ ft. of 12 in. by ¾ in. stock, and 10 ft. of 1 in. square stock, plus a piece of ¼ in. plywood 12x26 in. That's all.

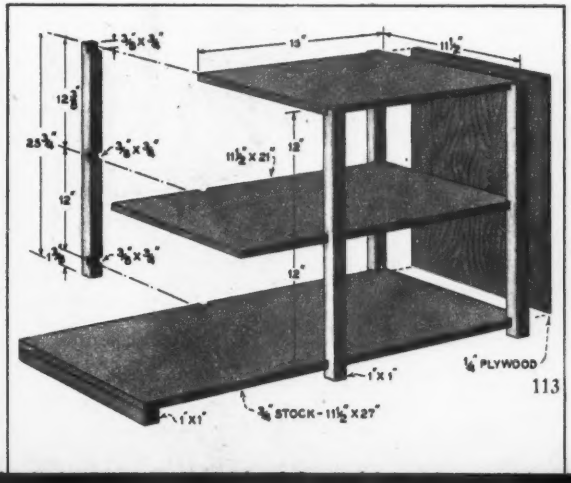
Cut the shelves, back and four legs to the dimensions shown in the drawing. Assemble by driving one screw into the shelf at each notch, and nail or screw the plywood back in place. For a really solid job, apply casein glue to the contacting parts before assembling with the screws. Allow to set for 24 hours, then sand and paint to suit.

Need more shelf-space in your home for books, magazines and radio?



Note crosspiece at bottom and angle irons.

The finished table. Drawing at right shows all dimensions.



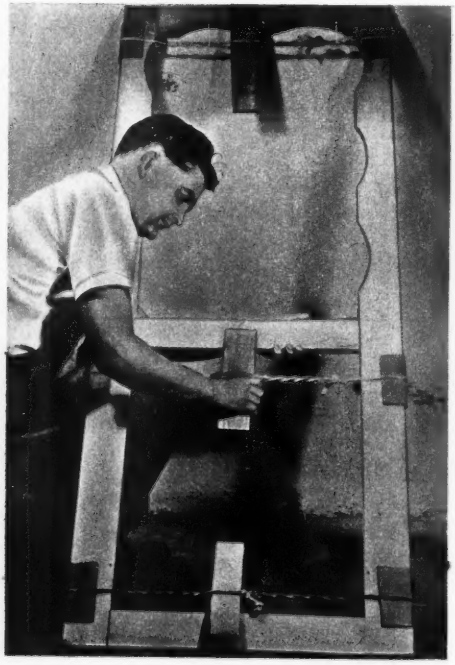
corner cabinet

Brighten up the corner of your home with this decorative cupboard.

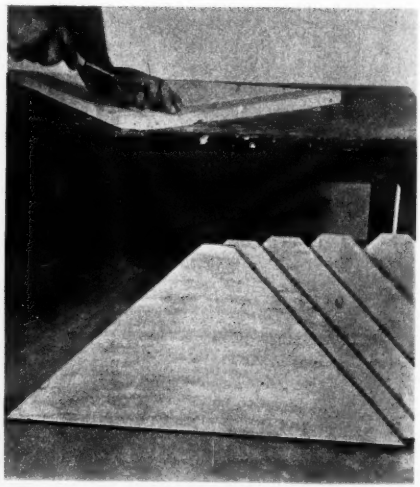
BY BERTRAM BROWNOLD

UNLESS you are fortunate enough to live in a lighthouse, corners are wasted space as far as using ordinary furniture in them is concerned. However, if you'll take another look at the photo above (this time at the cabinet), you'll see that it fills this usual lost space and at the same time provides shelves for your wife's china whatnots and space for your pipes, old golf balls and other odd gear in the storage compartment below.

If the cabinet is your first attempt at wood working, don't worry about the construction because it's as easy as "A.B.C." With a few hand tools and a little common sense anyone can finish it in short order. If you're an old hand at the game, one glance at the drawing and photos will convince you that it's as simple as it looks.



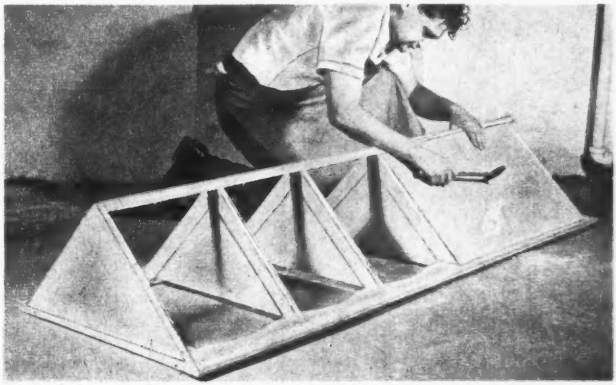
Using twisted ropes, sometimes called a Spanish Windlass, to clamp the frame parts together. Cardboard strips protect the wood from rope marks.



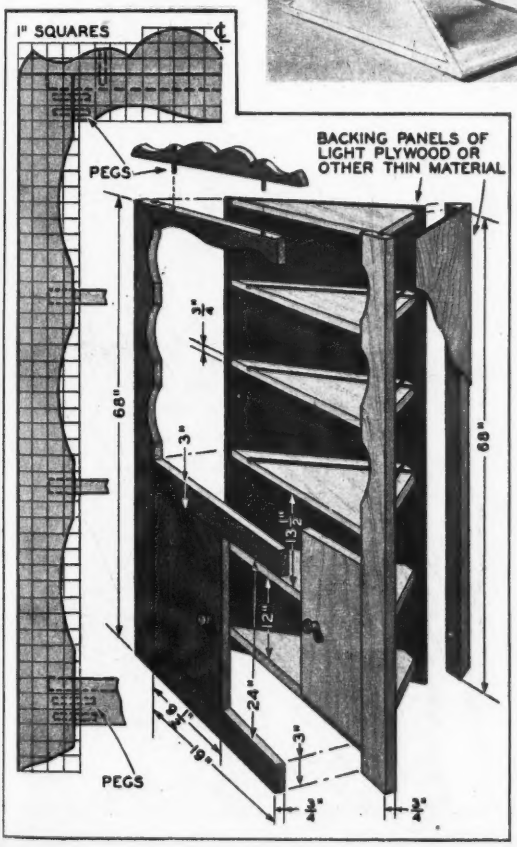
Cutting plate grooves, ¼ in. wide by ⅛ in. deep, in the shelves. Grooves are sanded smooth. Clamping or nailing the shelves to a bench helps

Regardless of which league you're in, the first step is to cut out the five parts of the frame and glue them together with pegs. By using the rope clamps the man in the photo is demonstrating, the frame will have tight joints. Next in line are the six triangular shelves. On three of these you'll have to cut plate grooves, using a ¼ in. gouge for the job. When the remaining parts have been cut to shape, nail the frame and shelves together and hang the doors in place. Follow this, by nailing on the backing panels and adding the ornamental top piece. After all surfaces have been thoroughly sanded, the cabinet can be painted to match the other furniture in the room. The decorations on the cupboard shown in the photo are floral designs cut from wallpaper and then glued in place.

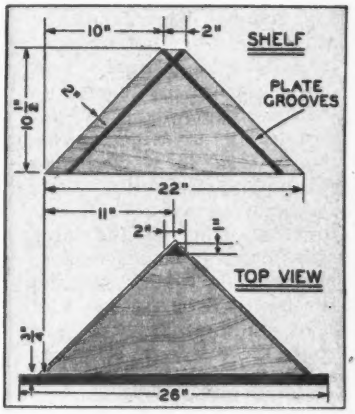
By hanging the doors before the back panels are fastened in place, the work is easier to handle.

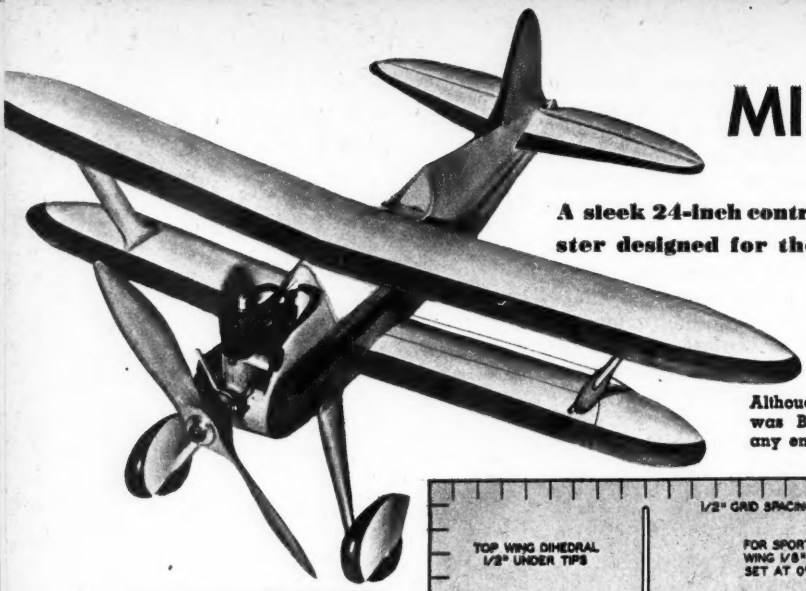


Nailing on the backing panels after the cabinet is assembled. Beaverboard or linoleum can be substituted for plywood.



Curves in the frame parts are cut with a coping saw. Door knobs and spring catches are from the dime store. Only three of the shelves have grooves cut.





MI BIPE

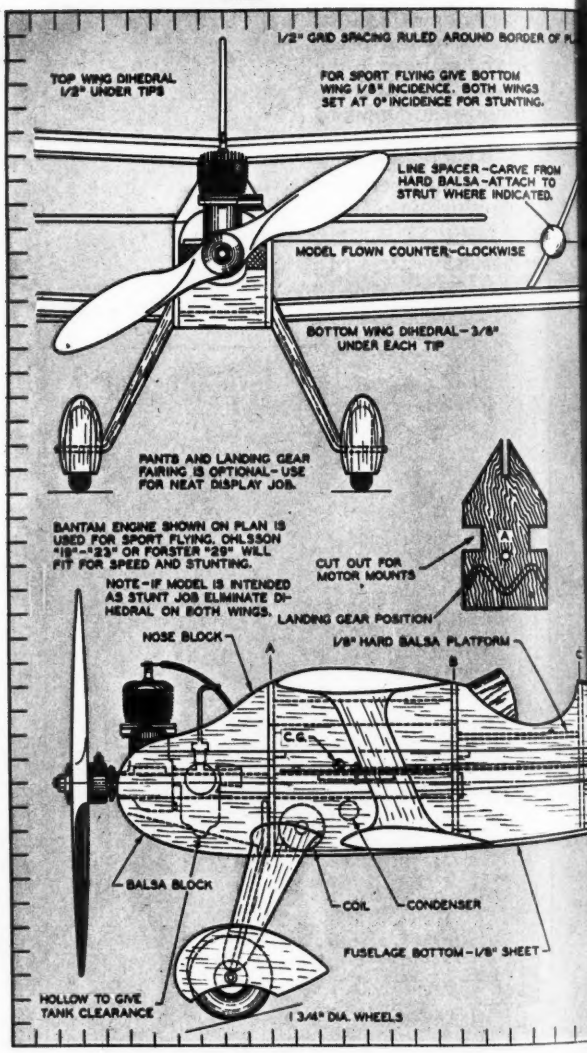
A sleek 24-inch control-line sportster designed for the beginner.

Although original model was Bantam powered, any engine can be used.

BY JOHN T. FRANKLIN

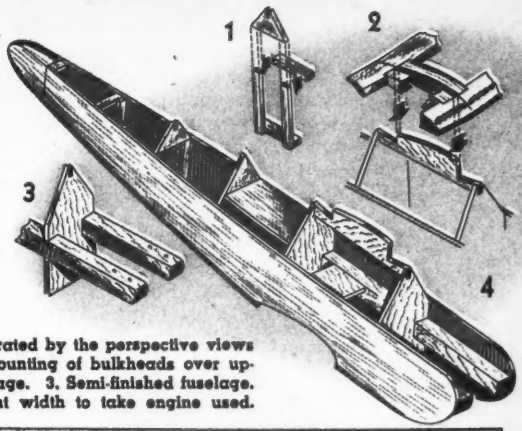
CONTROL-LINE flying new to you? Then the MI Bipe is the model to pick as a starter! Simple construction, it's a snap to build! Easy on the eyes, just look at those lines! Performance? Take your choice . . . for sport flying and training purposes, use a Bantam, Ohlsson 23, or Bullet. If it's speed or stunt flying you're after, just watch what happens by changing over to a Forster 29, Cannon or any other engine having the same cubic inch displacement!

For either sport or stunt flying, the MI Bipe holds the advantage over monoplanes because biplanes usually have better stalling characteristics than most monoplanes and can therefore be landed more easily, making them ideal for training. For stunting, their smaller wing span as compared to monoplanes of the same area, makes them much more maneuverable. Before starting construction, enlarge the plans on these pages or save yourself a lot of time by taking advantage of the MI Reader Plan Service in

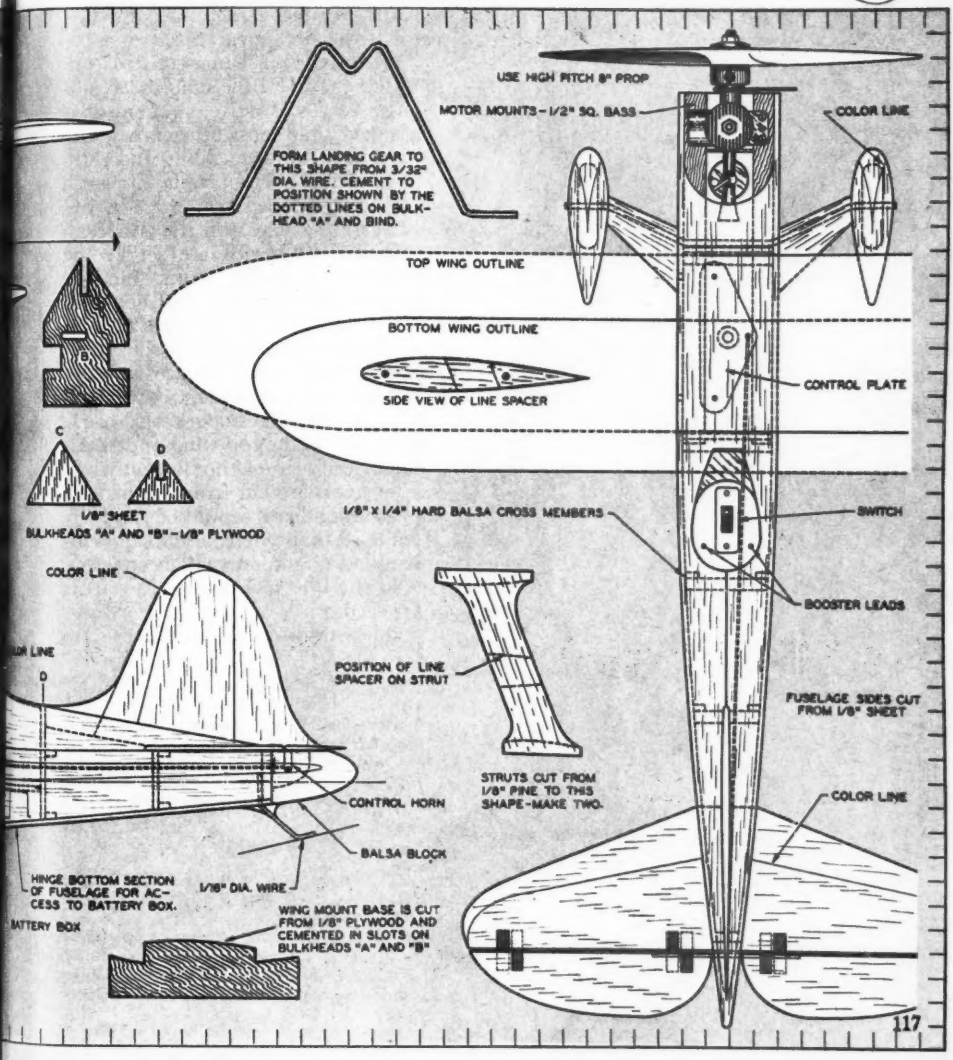


obtaining full size drawings.

With the exception of a flat-sided box type fuselage nothing could be simpler. Cut out the fuselage sides from fairly hard 1/8 in. sheet balsa and cement the hardwood motor mounts in position, as shown. Add the two plywood bulkheads A and B, allowing ample time for cement to dry before proceeding. Watch to see that



Fuselage construction is very simple, as illustrated by the perspective views shown at the right. FIG. 1 shows typical mounting of bulkheads over uprights. 2. Mounting the top wing on the fuselage. 3. Semi-finished fuselage. 4. Motor mount installation. Vary the mount width to take engine used.



the semi-finished structure does not go out of line in the process of drying. Attach the 1/8 x 1/4 in. cross members in place, working from the nose towards the rear, and then attach the tail block.

The bottom of the fuselage, formed from sections of 1/8 in. hard balsa, is added next. When dry, trim away the surplus wood and sand smooth. The section beneath the battery box is hinged to gain easy access to the batteries. Before building the turtledeck, install the ignition and control-line systems. Make certain that the ignition system is hooked up correctly and that the bell crank works smoothly. Once the turtledeck is added, you will not be able to make corrections. While installing the ignition and control mechanism, add the landing gear.

Complete the fuselage by building the turtledeck from 1/8 in. sheet balsa and inserting a block to form the bottom of the nose. Don't forget, however, to install the plywood top wing attachment base in the slots shown at the top of the two plywood motor mount bulkheads. The landing gear fairings and wheel pants are optional features designed for attractive appearance.

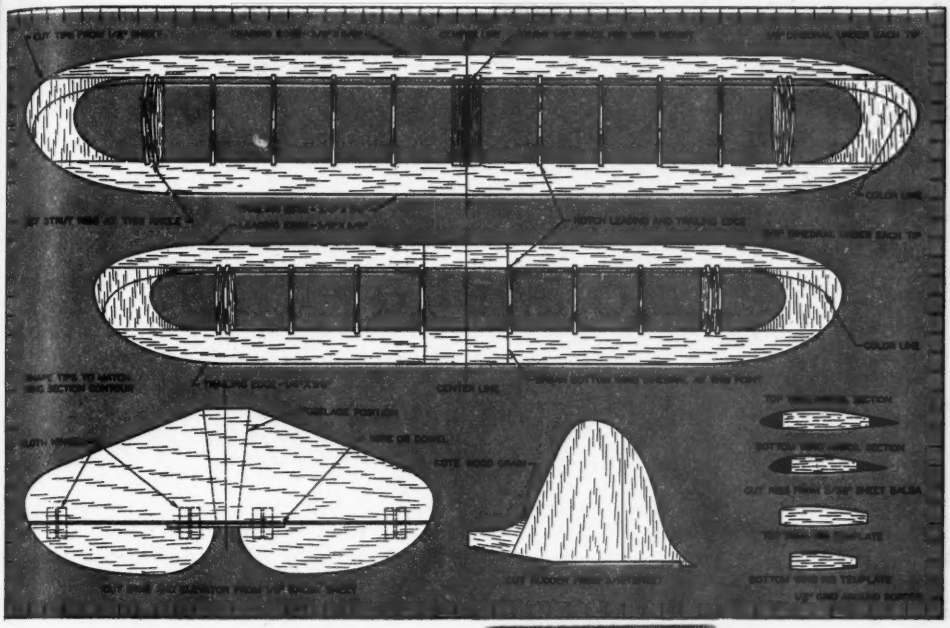
This type of wing construction which the MI Bipe employs is not only easy to make, but also is stronger than most other types. Use hard balsa for the leading and trailing edges, shape to profile shown on the plan and then notch for the ribs. Note that where the struts are attached double ribs are set at the same angle as the struts. Pin the semi-finished leading and trailing edge on the plan and cement the ribs into position. Add the tips and sandpaper after the framework is removed from the plan. After the wings are sanded smooth, add 1/2 in. dihedral on the top wing and 3/8 in. under each tip of the bottom wing. The struts are cut from 1/8 in. pine or basswood and should be carefully made so that when the model is assembled alignment will be perfect. Add the line spacer after the struts are secure.

The stabilizer and elevators are

Starting the MI Bipe below a flight. Landing gear well forward cuts prop breakage.

Photos by Beverly Smith

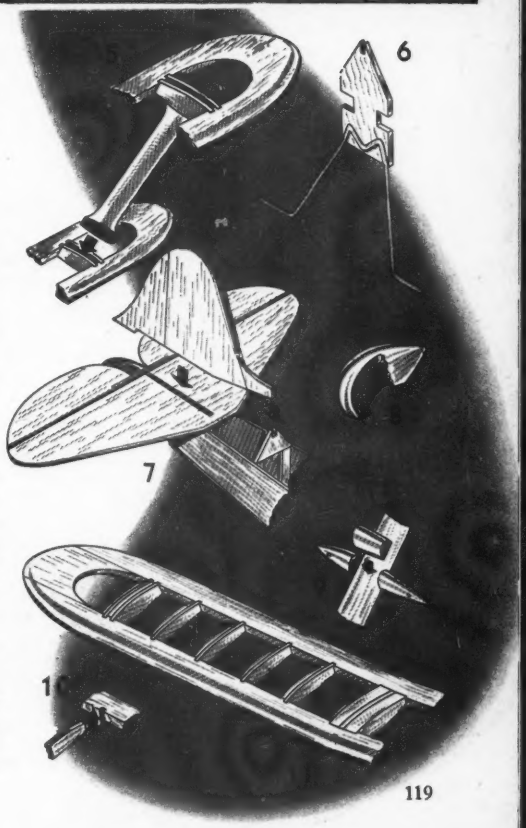
FULL SIZE PLANS see page 139



cut from 1/8 in. hard balsa sanded to form a streamlined section. Aluminum tubing or wire can be used to connect the two elevator halves. Use cloth hinges for the elevator but first attach the control horn. Once the elevators operate smoothly, cement to fuselage and check for alignment. The fin and rudder are cut from $\frac{3}{16}$ in. sheet balsa in the same manner as stabilizer. Note that the base sets into a slot on the bulkhead and rests on the stabilizer.

Attach the bottom wing first and make certain that it lines up with the tail surfaces. The top wing slides in place over the plywood wing attachment.

Before flying, check to see that the center of gravity location is as marked on drawings. Rather than offset the rudder or motor to keep the wires taut, the MI Bipe is simply flown against torque. On the first test hop take off down wind and allow the model to pick up plenty of speed before trying to pick her off.



Rest of the construction is equally easy. FIG. 5 shows attaching the struts between double ribs. 6. Position of landing gear on bulkhead A. 7. Attaching the rudder after sabilizer is cemented to fuselage. 8. Wheel pants cutaway. 9. Line spacer on left wing strut. 10. Trailing edge is notched for ribs. 11. Completed wing panel.

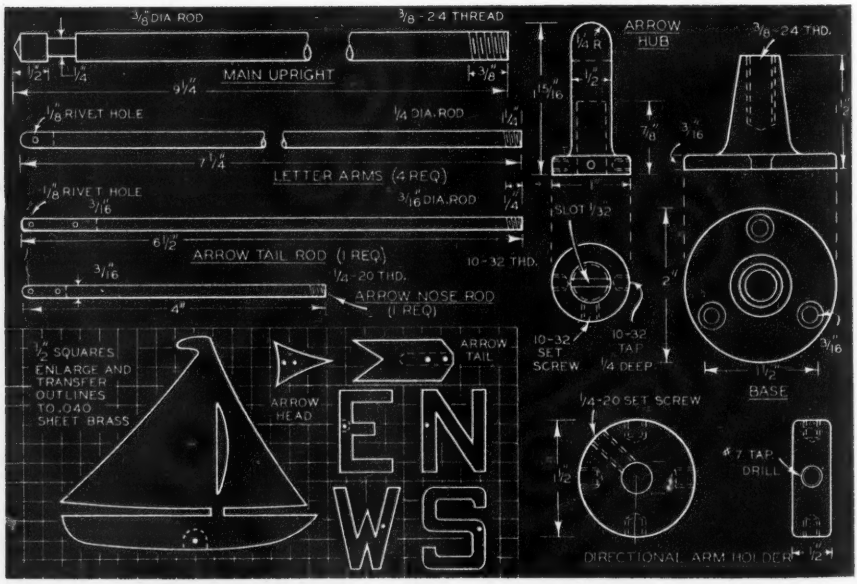
BY AL SPAMPANI

Spend a few extra hours in your workshop and machine this distinctive

flagpole WEATHER VANE

IF YOU'RE an amateur "weather man" (meteorologist, if you prefer) and are concerned as to which way the wind blows, this weather vane should have special appeal. Built entirely from brass and lacquered to prevent corrosion, it will last you a lifetime.

Start construction with the base, which is turned from 2 in. diameter brass. Chuck the stock, drill the hole with a letter Q drill, tap 3/8-24 and spot the points for the mounting screws. Next, cut the main upright from 3/8 in. diameter stock and thread one end 3/8 -24. It is extremely important that the thread be perfect else the vane, when mounted, will lean to one side and give an incorrect wind reading. Once the end is threaded, re-chuck and turn the opposite end, as shown. The pointed tip reduces friction to a minimum while the undercut is for a setscrew which prevents the arrow from blowing off in a

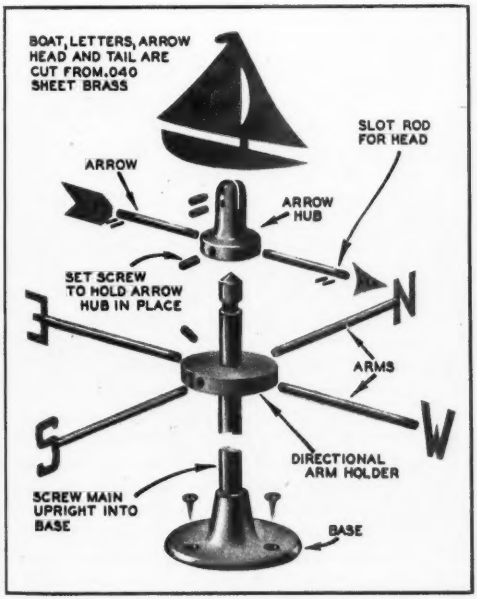


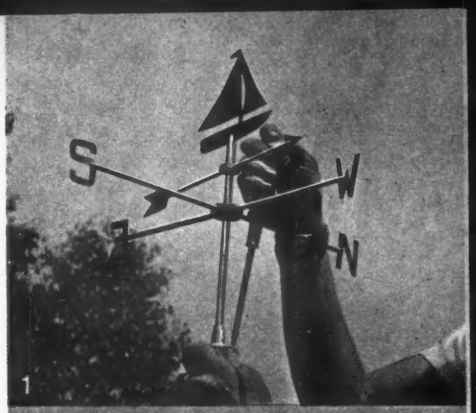
highwind. Screw the main rod into the base and proceed to turn the back of base smooth. Remove from the chuck and drill the holes for the mounting screws.

The direction arm holder is machined next. Turn the piece to 1½ in. diameter, drill the shaft hole and then round the corners off. Index the piece for the letter arm holes if your lathe is equipped with an indexing mechanism, and then cut off with a parting tool. If your lathe is not equipped for indexing then lay out by hand. Clamp the arm holder in a drill press vise and, with a No. 6 drill, drill each hole $\frac{5}{16}$ in. deep. Tap ¼-20. The hole for the setscrew is next drilled and tapped 10-32.

Next, cut the four letter arms to length, thread ¼-20 and drill for the rivet holes. Cut the rods for the arrow shaft, thread and drill as indicated. Slot all rods with either a hack saw or a milling saw mounted on short arbor.

Turn the arrow hub from a piece of 1 in. diameter stock and drill the holes for the shaft and retaining screw. Tap the holes for the shafts and retaining screws as shown. Enlarge the outlines for the letters, arrow parts and sailboat and then transfer to piece of .040 sheet brass. Cut out each part with a tin snipper and file the edges smooth. After all parts are complete drill for the mounting rivets. The various components are assembled as illustrated in the drawing below.



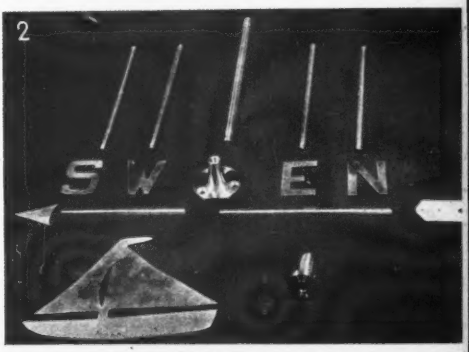


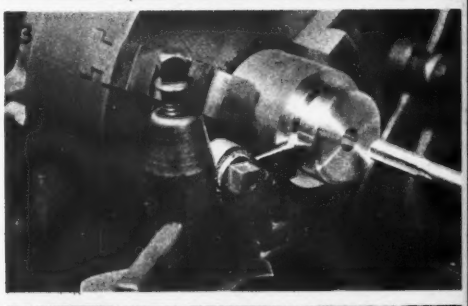
1 Finish with a coat of clear lacquer and then screw the vane to your flagpole.

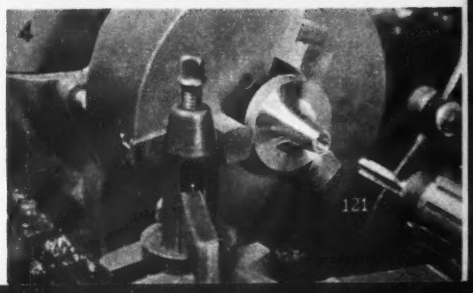
2 Project is both easy and inexpensive to make. Material cost is about one dollar.

3 Threading the base hole for the upright. Screw upright into base to face back.

4 After the arm holder is indexed for the arm holes, cut off with a parting tool.







BUILDING MALLARD

BY WILLIAM D. JACKSON

Light enough for car top carrying, this 14-foot plywood duck boat will keep you dry on hunting trips and also make a good blind.

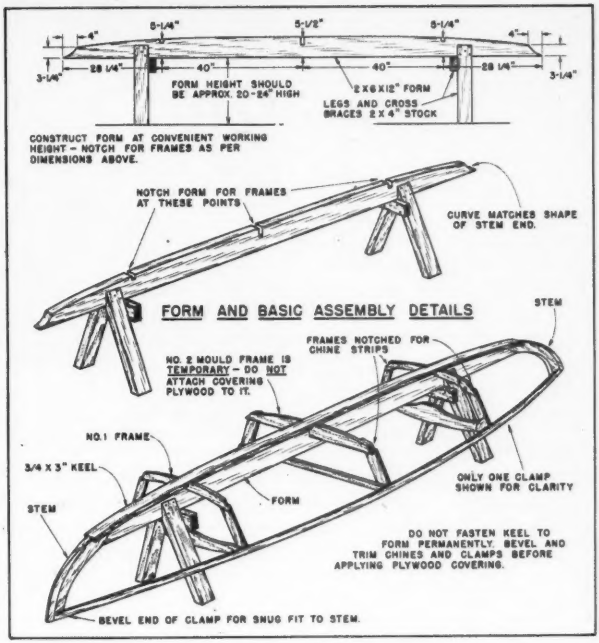
AUTUMN has a variety of meanings for the sportsman. To some it means the sight of a fine buck or the whirr of a covey of ruffed grouse. But to the confirmed duck hunter, it is the welcome sight of long flights of greenheads or pintails on the way to their feeding grounds. Like many other sports, the pleasure derived from this form of hunting depends to a large extent on the equipment employed. And at the top of the list in importance is the type of boat used. If it's some heavy old skiff rented on the grounds or a makeshift skeet that drenches you with spray when the wind picks up, the hunting becomes a chore instead of a sport. On the other hand, with a boat like Mallard that is especially designed for duck hunting, you'll get more enjoyment from your gunning and maybe bag an extra bird or two.

The boat described in this article is extremely light in weight, just under 100 lbs., so that it rides on top of your car instead of in a trailer behind it. For all this lightness, the boat is strong and rugged, thanks to the sturdy framing and the plywood construction. By using ordinary care in building and under normal service conditions, there shouldn't be any leaks during the lifetime of the boat. And there's no need to worry about spray coming aboard, the 11 inch freeboard will keep you bone dry and it is also low enough to permit using the boat as a blind when it's pulled ashore. An added attraction of this design is that by using the alternate square stern construction shown on the plans, you can attach an outboard motor and use Mallard for your fishing or general sports use as well as for hunting.

After you decide which type of boat you're going to build, either double end or outboard type, and adjusted the bill of materials accordingly, the first step is to make the building form, resembling a

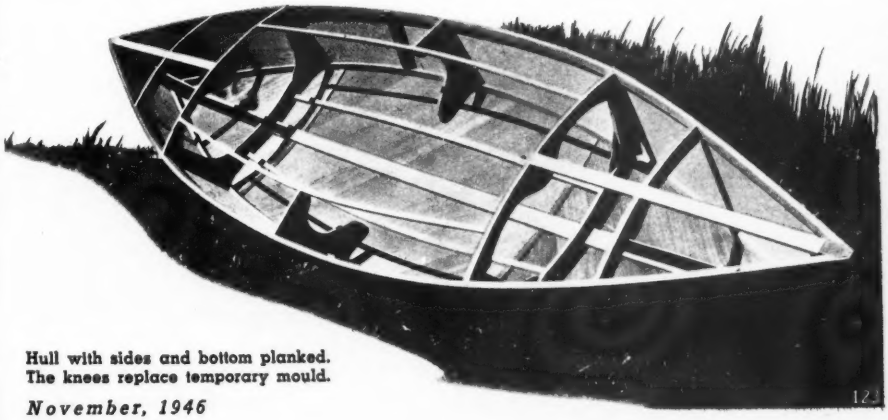
saw horse, on which the boat is built bottom side up. At this point it might be well to mention the fact that the plans on these pages appear in reduced form, which makes it necessary for you to make full-size paper patterns of the stem, frames, knees and transom (For outboard type only). Large-scale drawings of Mallard are also available from the MECHANIX ILLUSTRATED Reader Blueprint Service.

The description of the construction which follows is given for the double end type boat only. With a few minor changes, it also applies to the outboard type. For either boat, the paper patterns that have been drawn full size are placed on top of the material, the outlines pricked through and the parts sawed to shape. As the temporary mould (in the double end type only) will be discarded later on, use common lumber in making this. For the same reason, don't screw any parts of the framing to this mould but use lightly driven nails instead. After all the parts are cut to shape, the stems are beveled and notched for the keel, and the frames assembled on top of the patterns. Fasten the frames together by using plywood gussets, glued and secured with 1 in. No. 8 flat-head wood screws. The frames are then notched for the keel, chines and clamps.



Building form on which hull framing is assembled bottom side up. The form can be made of common lumber as it is discarded later.

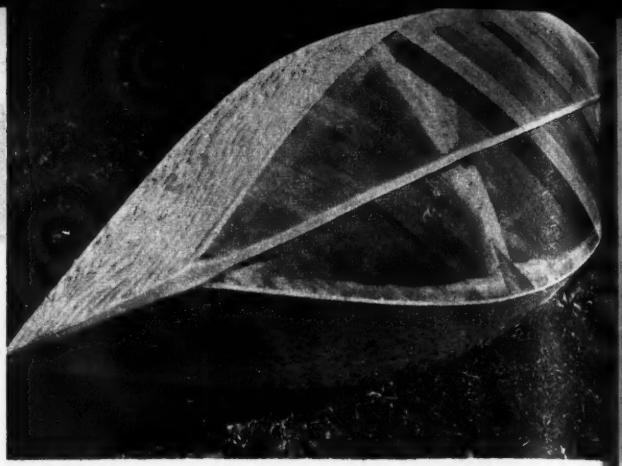
The next step is to notch the building form to take the frames and stems which are mounted in their correct stations or positions. With the aid of a light batten sprung around the frames, they are marked and beveled. Follow this by fastening the 3/4 in. by 3 in. inner keel to



Hull with sides and bottom planked. The knees replace temporary mould.

MALLARD BLUEPRINTS

Large-scale prints are an aid in constructing this boat. For full information, turn to page 139.

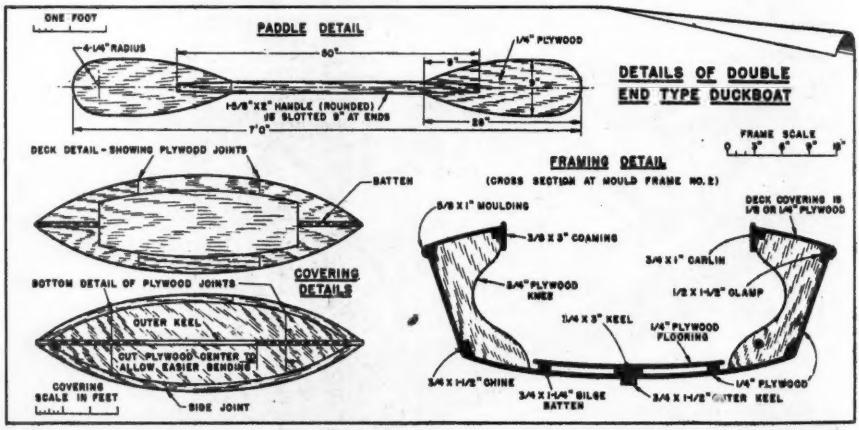


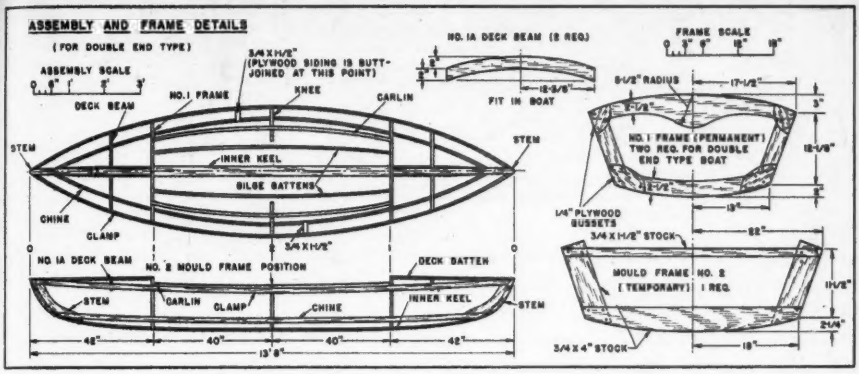
View of bottom planking with outer keel fastened in place. Seams in plywood are reinforced inside the hull with battens.

the frame and stem notches using glue and two 1¾ in. screws at each notch. The chines and clamps are then sprung into place, the ends beveled to fit the stems and fastened with glue and one 1¾ in. No. 8 screw at each joint. Halfway between the keel and each chine on either side, notch the frames for the bilge battens so they are a flush fit, and secure them in place with glue and one 1¾ in. No. 8 screw at each point.

The framing is now almost completed and all that remains is to trim and fair it (remove the flat spots) before applying the plywood planking on the bottom and sides. On the boat shown in the photos, 45° grain mahogany plywood was used but any resinous glued fir plywood can be used. However, if you can't obtain this material, thin cedar planking, ½ in. in thickness can be substituted. With this, it will be necessary to use ½ in. by 1 in. battens, glued and nailed behind the seams. Using plywood, the bottom is planked first by making a paper pattern of the center area and then laying it on the 4 by 8 ft. sheet, so that you will have enough material left to plank the remainder of the bottom. By using paper or cardboard patterns and juggling them to fit the sheet, you'll avoid making errors in cutting the plywood. The arrangement of the plywood pieces on the bottom is shown in the drawing below. After the middle piece has been marked and cut to shape, slit it down the center for about a foot at either end so that it will be easier to bend to shape. Again using patterns, mark the remainder of the plywood sheet for the rest of the bottom planking and cut the pieces to shape. Before fastening the planking in place, coat all surfaces of the

Details of plywood planking and cross section of hull construction amidships.





framing with a good marine glue and lay cloth strips on top of the wood. The strips are then recoated with the glue and the planking secured to the framing using 1 in. No. 8 screws, spaced 2 in. apart. A 1/4 in. by 1 1/2 in. oak batten is glued and fastened behind each seam using 5/8 in. copper or galvanized tacks. After the glue is dry, the planking is trimmed flush with the sides and any excess glue removed.

Bill of materials is for double end type duck boat. For outboard model, estimate additional material for No. 2 frames, transom and larger bottom planking.

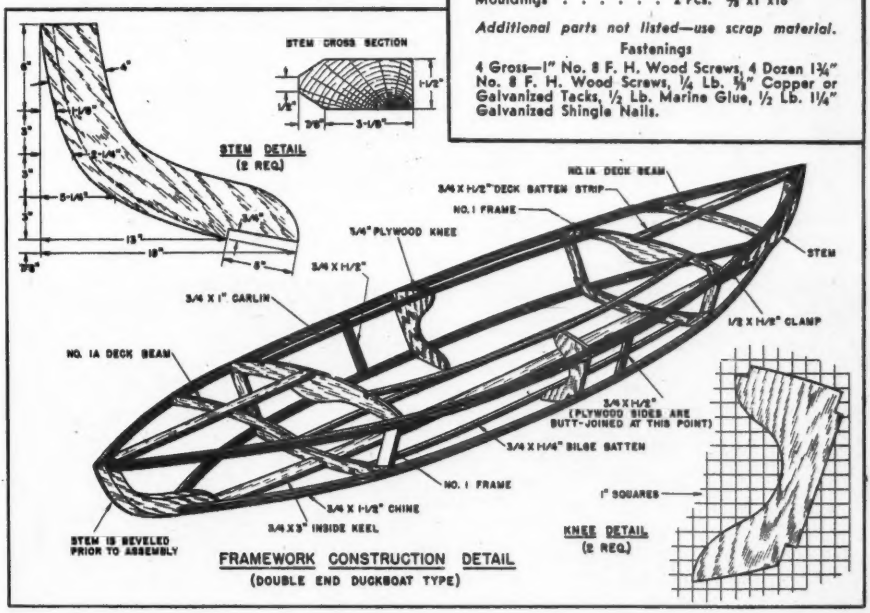
BILL OF MATERIALS

Plywood		
Bottom	1 Pc.	1/4"x4'x8'
Sides	1 Pc.	1/4"x4'x8'
Deck	1 Pc.	1/8"or1/4"x4'x8'
Knees	1 Pc.	3/4"x2'x2'
Framing		
Inner Keel	1 Pc.	3/4"x3"x12'
Outer Keel	1 Pc.	3/4"x1 1/2"x12'
Clamps	2 Pcs.	1/2"x1 1/2"x16'
Chines	2 Pcs.	3/4"x1 1/2"x14'
No. 1 Frames (Permanent)	1 Pc.	3/4"x2 1/2"x3'
(Std. Lumber Width)	1 Pc.	3/4"x5 1/2"x6'
Mould Frame No. 2 (Temp.) (Common Lumber)	1 Pc.	3/4"x4"x6'
Stems	1 Pc.	1 1/2"x10"x2'
Bilge Battens	2 Pcs.	3/4"x1 1/4"x8'
Deck Beams	2 Pcs.	3/4"x5 1/2"x5'
Deck Battens	1 Pc.	3/4"x1 1/2"x6'
Carlins	2 Pcs.	3/4"x1"x8'
Coaming	2 Pcs.	3/8"x3"x8'
Mouldings	2 Pcs.	3/8"x1"x16'

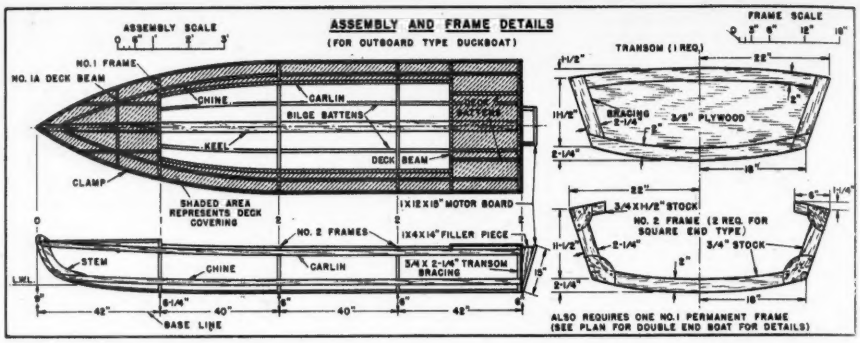
Additional parts not listed—use scrap material.

Fastenings

4 Gross—1" No. 8 F. H. Wood Screws, 4 Dozen 1 3/4" No. 8 F. H. Wood Screws, 1/4 Lb. 5/8" Copper or Galvanized Tacks, 1/2 Lb. Marine Glue, 1/2 Lb. 1 1/4" Galvanized Shingle Nails.



FRAMEWORK CONSTRUCTION DETAIL
(DOUBLE END DUCKBOAT TYPE)



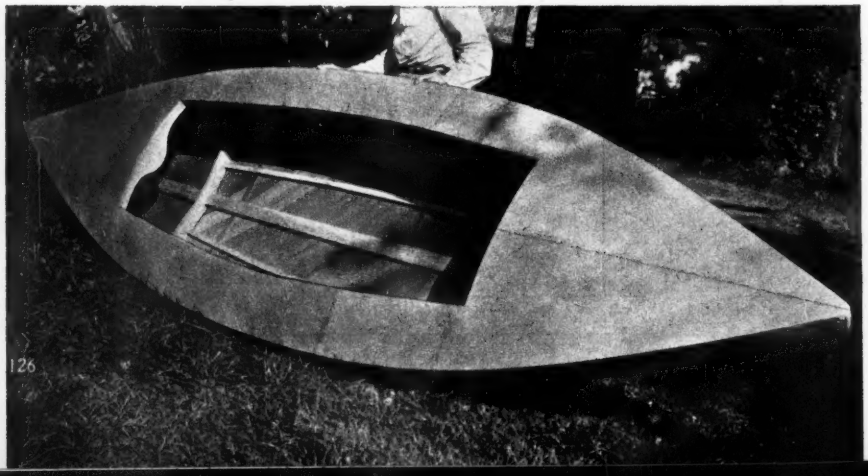
The procedure in planking the sides is very similar to that just described for the bottom. Paper or cardboard patterns are again used to lay out the sides on a 4 by 8 ft. sheet of plywood, the pieces marked and cut to shape. Repeat the gluing process using cloth strips and fasten the plywood to the chines with 1 in. No. 8 screws and to the clamps with 1¼ in. galvanized shingle nails, clinched on the inside. Seam battens similar to those on the bottom are used behind the joints. Trim the planking and remove surplus glue.

At this point the hull is removed from the building form and turned right side up. The nails in the temporary mould are pulled out, the mould removed and discarded. In its place, the plywood knees are fitted. These are glued and fastened in place from the outside, using 1 in. No. 8 screws. Notches are cut in the knees and the tops of the frames for the carlins, which are glued in place with a 1¾ in. screw at each joint. The deck beams are then fitted in place, glued and fastened with one 1¾ in. No. 8 screw through each clamp from the outside. The last step in the framing is to install the deck battens, notching the stems, deck beams and tops of the frames for them. The deck is now covered with ⅛ in. plywood for light service or ¼ in. material for heavier duty. Follow the method previously described.

After the deck has been trimmed, fasten the cockpit coamings in place with glue and 1 in. No. 8 screws, then finish off the seams with ¼ in. by 1½ in. battens. Fasten the mouldings in place along the sheer, using 1 in. No. 8 screws about 8 in. apart. The exposed edges at the stem are covered with a band ⅜ in. by 1½ in. screw fastened. The hull is then turned bottom side up and the ¾ in. by 1½ in. outer keel secured with glue in 1 in. No. 8 screws spaced about 6 in. apart. Fair the ends of the keel into the stem bands.

All that remains to finish Mallard is to plug the screw holes and apply two coats of plywood sealer inside and out. Follow this with several coats of a good marine enamel preferably of a dead grass shade.

Double end type Mallard completely decked and ready for the finishing touches.

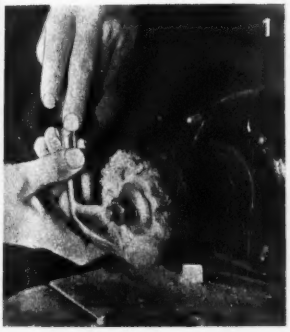


Ideal storage place for your clubs is in a dry closet, suspended from a rack.

winter care for your golf clubs

UNLESS you've lost too many golf balls this year and dug too much turf, you'll want your clubs in top-notch condition for next year's session. Rather than hang your bag in the cellar or garage, spend a few hours and prepare those woods and irons for their winter sleep—and come spring you'll be glad you did! Follow the suggestions offered below and you'll not only keep your clubs in A-1 condition but you'll prolong their life for many seasons to come.

Clean the heads with a soft buffing wheel, using a stick of polishing rouge. Do not use a heavy abrasive.



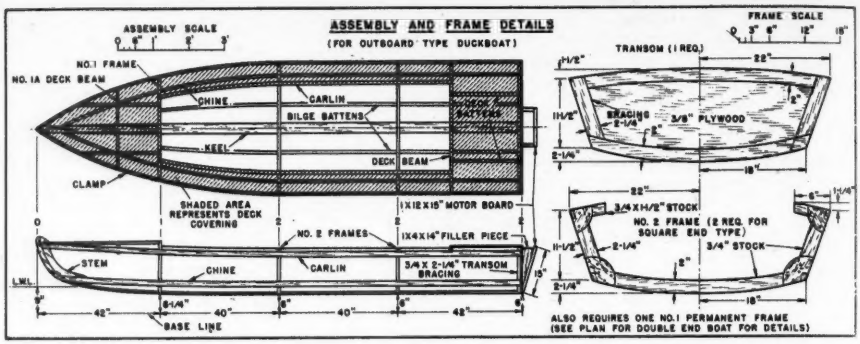
Once buffed, apply a thin coat of oil or Vaseline. Clean with gasoline or kerosene when clubs are taken out of storage.

Rub the leather grips of each club with No. 00 sandpaper and then follow with a light application of neat's-foot oil.

If binding needs replacing, heavy shoemaker's thread may be used. Shellac area, wind before shellac dries.

If the wood screws holding the metal soles work loose, a thin layer of solder will correct the trouble permanently.

Preserve the liveliness of your golf balls by storing them in a bottle painted black or sealed tin can, as shown.



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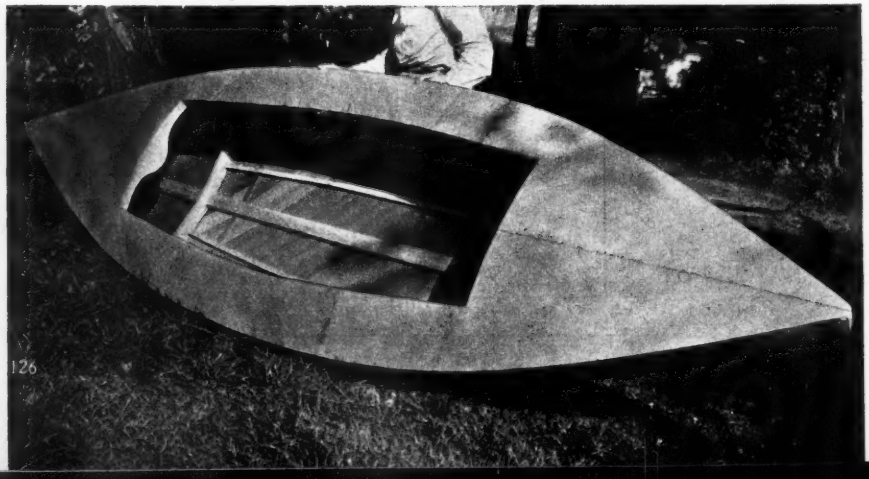

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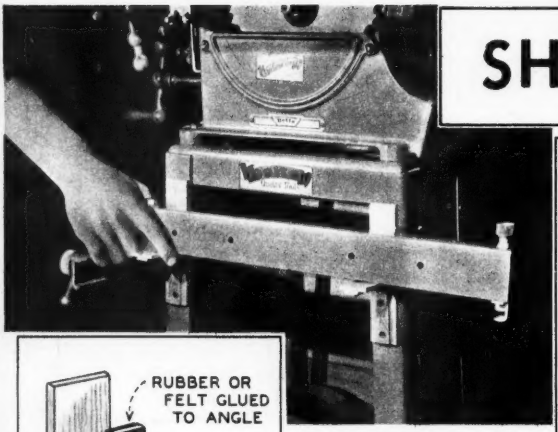
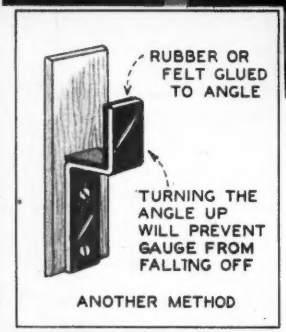
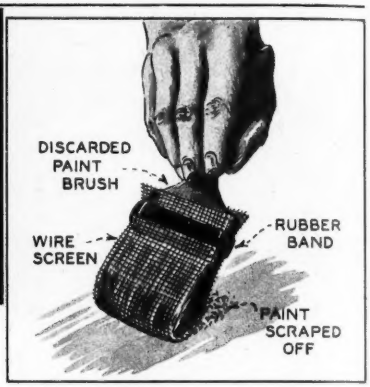
SHOP IDEAS

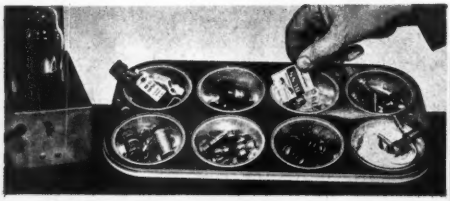




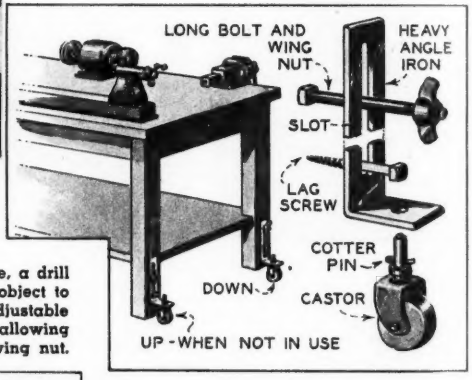
SAW GAUGE SHELF. When not in use, the rip gauge of a circular saw can be kept on a shelf on the side legs of the saw table. This "shelf" consists merely of two L-shaped brackets about 3 in. long, fastened by means of machine screws. Thin pieces of rubber or felt protect the finish on table and gauge.



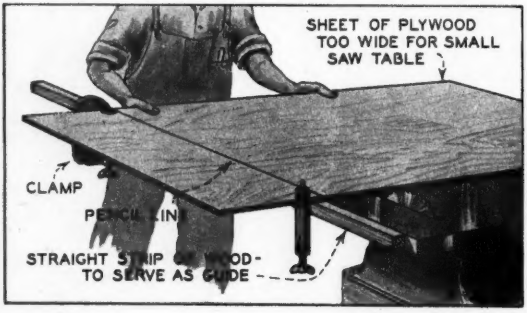
PAINT REMOVER. A combined applicator and scraper for paint remover may be made by folding a strip of heavy screen wire over the stub bristles of a worn-out paint brush. The bristles will hold enough of the fluid to apply as the work progresses and the screen wire will serve as a scratchless scraper to remove the skin of paint or varnish.



SMALL PARTS CONTAINER. A muffin pan makes an ideal container for small radio or appliance parts. Such parts are easily seen, remain separated and can be readily removed.

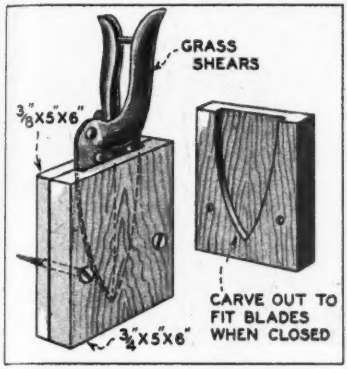


ROLL YOUR OWN. A bench loaded with a lathe, a drill press and perhaps a motor grinder, is a heavy object to move about the shop without assistance. The adjustable rollers make the task easy. Lift each corner in turn, allowing the angle iron to drop down, then tighten the wing nut.

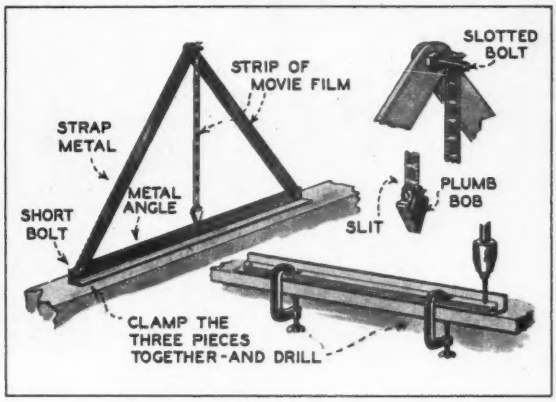


CUTTING LARGE PLYWOOD SHEETS. Often it is necessary to cut plywood or paneling on a power saw with a table much too small to hold the work. Thus it is impossible to use the miter gage. However, the edge of the saw table can be used in place of the miter gage to guide the work squarely against the saw. With a square, mark a line across the work. Then take a trued-up strip of wood and nail it flush with the pencil line across the work. Place the work on the saw table and run it against the saw, the strip, against the edge of the table, will serve as an accurate guide.

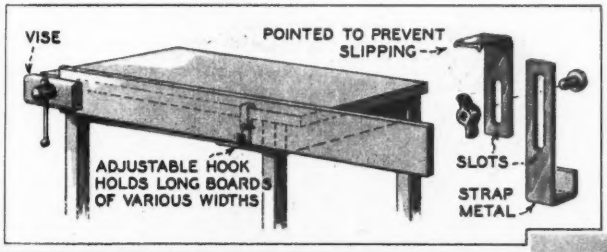
FOR THE CRAFTSMAN



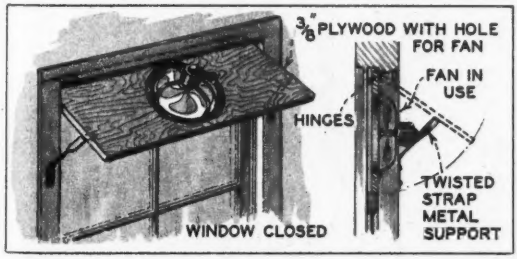
GARDEN SHEAR HOLSTER. Garden shears, like other cutting tools, work best when kept clean and protected from rust. This simple shear guard is always ready for use. Cut out two 5x6 in. blocks of wood and shape one block as shown to a quarter-inch depth. Fasten to wall with two long screws.



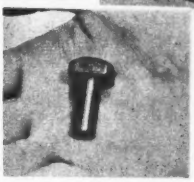
HOMEMADE LEVEL. This level is simple and very accurate. The contact bar is made of 1 in. angle iron, 3 ft. long. The uprights are made of 1 in. strap metal. The holes must be carefully spaced, in order to have the plumb bob accurately centered. The pivot bar is a bolt, slotted to take a strip of movie film while the plumb bob itself is a pointed piece of metal.



PLANING LONG BOARDS. Long boards can be easily planed if the bench has but one vise by using this adjustable hook. Provide two pieces of strap metal 1 in. wide and cut to whatever length is needed. The hook at the top should have the corners hammered down to sharp points to afford a grip.

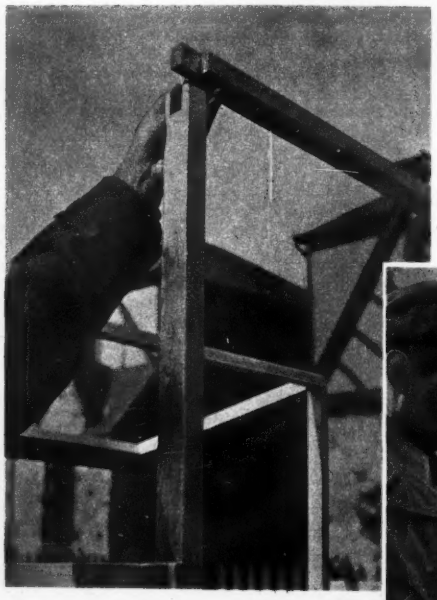


ADJUSTABLE VENTILATING FAN. If there is no hole in your kitchen wall for an exhaust fan a window can be made to serve. Get a piece of 3/8 in. plywood long enough to fit inside the window with an opening cut out for the fan. Two small hinges fitted to the underside of the window frame and the top of the board permit the fan to swing down. The metal straps keep it up when not in use.



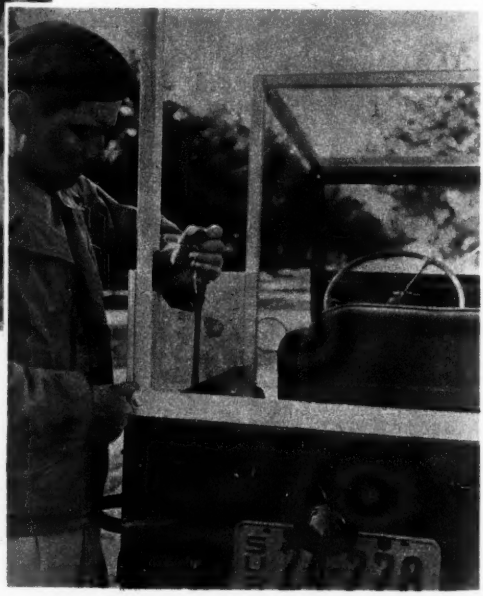
SCROLL SAW KINK. When the saber blade guide of the common type of 24 in. scroll saw is not being used, its hole quickly fills up with sawdust. An effective plug for this hole can be made by cutting a plug from a machine bolt.

Jivin' up the Jeep



RIDING in an open jeep is a lot of fun . . . until you run into the first rainfall. Then the wife or the girl friend decides that your next job is to add a body to the vehicle.

The pictures on these pages show how one ex-GI made the conversion, using Plexiglas and random pieces of plywood. Detailed construction drawings with dimensions are not included



Above and right: Basic framework is made of straight-grained 1½x1½ in. wood posts, the bottom ends of which are bolted to inside of jeep body. Top cross members rest in open mortise-and-tenon joints, reinforced by L-shaped iron brackets. Good average height of vertical pieces over back edge of jeep is 32 inches. Cover all surfaces of framework pieces with aluminum paint.

Left: revamped jeep allows use of sports clothes, eliminates need for parkas and blankets. Side and rear windows are 24x12x⅛ in. Plexiglas. Striped canvas seat covers are a decorative addition.

Right: Willys-Overland, originators of the jeep, are dressing up the commercial models. Here is a new all-steel body station wagon; capacity 7 passengers.

because other owners may want to adopt only the general idea and to adjust the dimensions to suit their own requirements and materials.

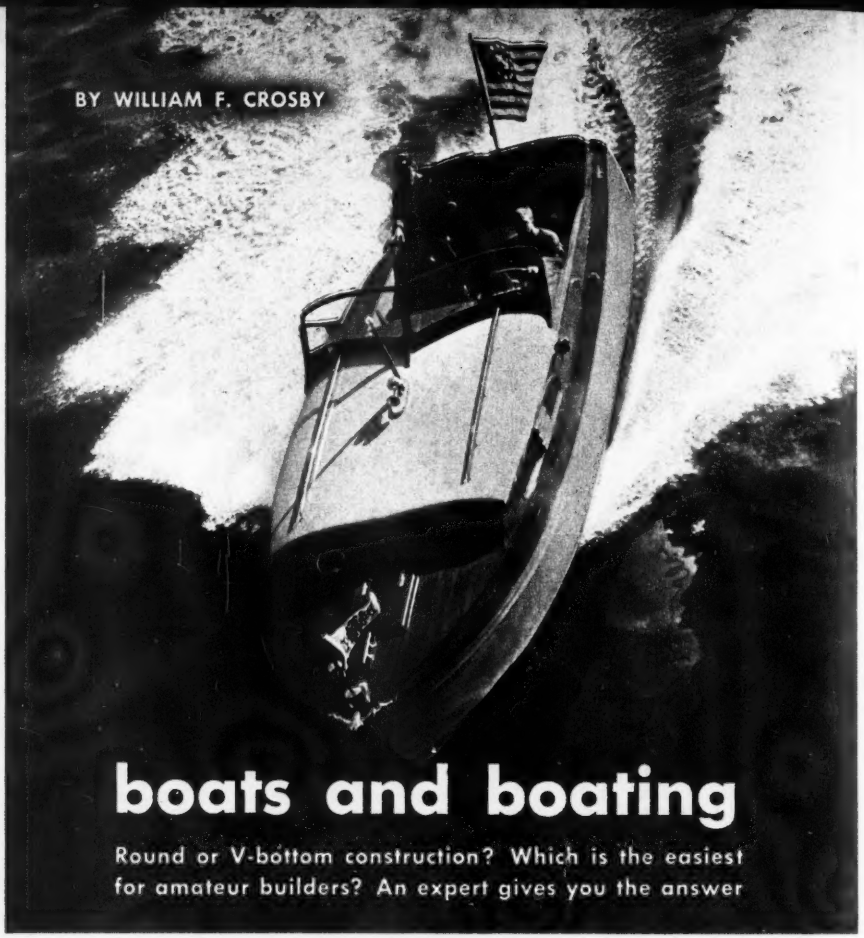
Waterproof plywood is, of course, the best body material. If you are forced to use the ordinary type, give all surfaces a priming coat of good aluminum paint and finish with an automobile body enamel of the kind that dries smooth without brushmarks. Be especially careful to seal the edges of the plywood with wood filler, sanded smooth. Unsealed edges will soak up moisture, causing the glue binder to soften.

How are you fixing up *your* jeep? Send in sketches or snapshots of changes and improvements that you have made, with short write-ups. For usable contributions, we pay good rates promptly on acceptance. Don't worry about your literary style; the ideas are what count. Address your letters to Joe Jeep, c/o MECHANIX ILLUSTRATED, 347 Madison Avenue, New York 17, N. Y. Please write your full name and address clearly, protect photos by means of heavy cardboard, and include return postage.

Above: Framework partially completed. Note that vertical center posts are just behind back edges of the front seats.

Right: Rear Plexiglas window slides in grooves in framework; permits fine through ventilation for hot, humid days.

BY WILLIAM F. CROSBY



boats and boating

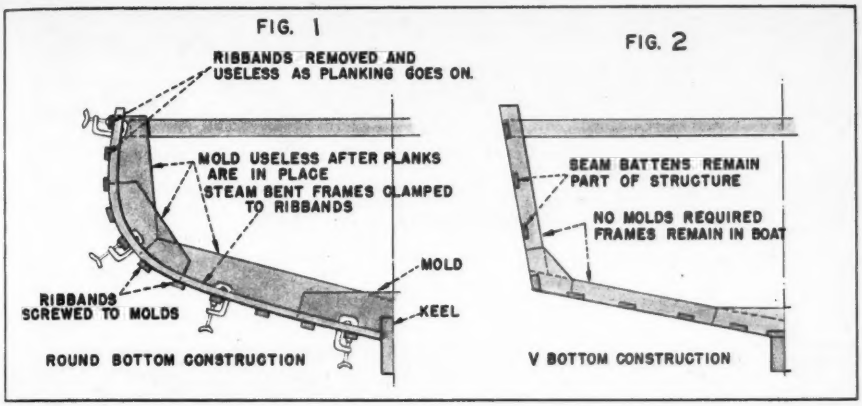
Round or V-bottom construction? Which is the easiest for amateur builders? An expert gives you the answer

1947 Elco Sport Cruiser

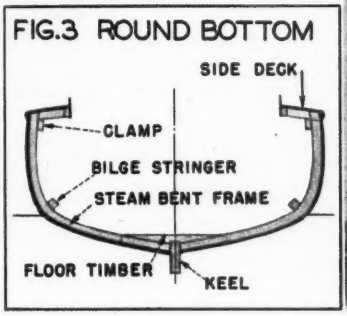
SINCE the V-bottom design was first developed, there has been a lot of discussion about the relative difficulty of construction for this type as compared with the older round bottom form of hull. The professional boat builder will argue that the latter is easier and cheaper to construct and this is probably true in his case—but not for the amateur. The reason for this will be evident when the construction methods for both types of hulls are compared.

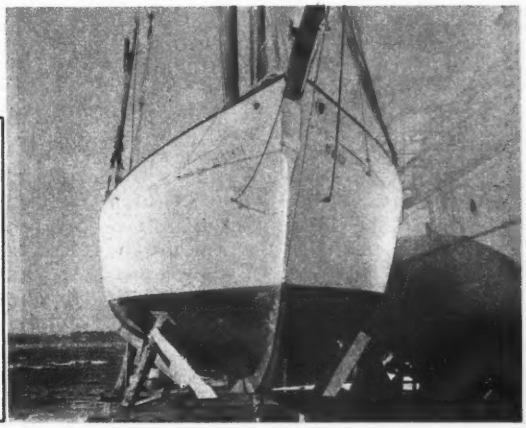
To begin with, in building either type boat full-size drawings of the lines have to be laid down. However, since every surface on the round bottom hull is curved, both fore-and-aft and athwartships, this job requires more skill and experience than the average amateur possesses. On the other hand, with a V-bottom hull the curves only run the length of the boat and in most cases, both the bottom and sides are straight lines. To accurately draw the section through a typical round bottom boat as shown in Fig. 1 requires at least 15 or 18 points from the table of offsets to get a fair curve from keel to deck. When this figure is compared with the five points required to draw the V-bottom section in Fig. 2, the saving in time and labor which this hull permits will begin to be appreciated.

With the lines laid down, the first step in building a round bottom boat is to make a mold of common lumber, such as the one shown in Fig. 1, for each section of the hull. The outer curved edges of these will determine the shape of the planking. The molds are then set up on the keel and long stringers called ribbands



Comparison of the sections through typical round and V-bottom boats. Right: Large schooner with round bottom hull. Note compound curves.

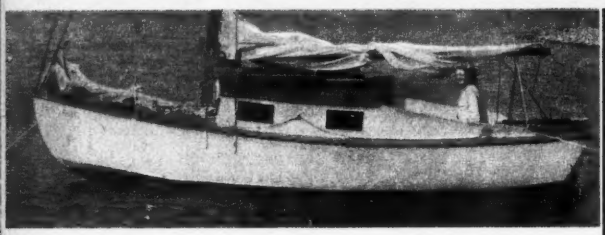




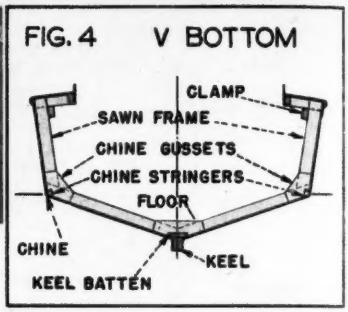
bent around them to form the fore-and-aft lines of the hull. Except in very light construction, these ribbands must be of fairly heavy material to avoid springing them out of shape and distorting the lines.

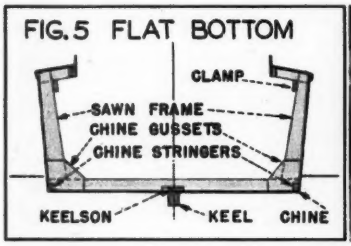
The next step, bending the frames to shape by steaming is the principal reason why round bottom boats are extremely difficult for the amateur to build. After going to the trouble of building a steam box, the material for the frames has to be cooked inside it until it is supple enough to bend it to shape inside the ribbands. There it is held in place by numerous C clamps as shown in Fig. 1. Because a number of frames have to be steamed and bent at one time, a large number of clamps are required which means added expense. With all the frames in place, the planking of the round bottom boat is started. As this work progresses, the ribbands are removed since their only function has been completed. When the planking is finished, all of the molds are removed from inside the hull and discarded. As far as the amateur builder is concerned both ribbands and molds are now just so much scrap lumber. Of course this isn't true for the professional builder because he can use his clamps over and over again and in most cases the ribbands as well. If he is building a stock boat, the molds can also be used many times. These are the features which make him say that round bottom boats are cheaper for him to build.

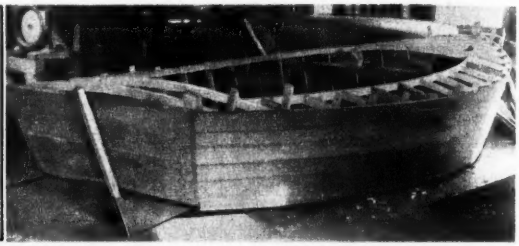
However, when the V-bottom construction shown in Fig. 2 is considered, this argument doesn't hold true and the reasons why this type of boat is preferred by



Auxiliary cruising sloop "Bonnie" with V-bottom hull and plywood construction, built from MI blueprint No. 944. Seaworthiness and good sailing qualities are the features.







Small flat bottom sail boat under construction. Hull is completely planked and ready for decking.

most amateurs become clear. Instead of buying lumber for molds, the prospective builder purchases material for the frames which in a typical V-bottom boat are sawn to shape and generally follow perfectly straight lines. The frames are set up on the keel in the same way as the molds but unlike them they are not discarded but become a part of the framing and remain for the life of the boat. In the same manner, instead of buying heavy lumber for ribbands, the V-bottom builder orders lighter material for the seam battens that back up the seams. Here again, these battens are notched into the frames and become a permanent part of the hull and are not discarded like the ribbands. In addition to these savings in labor and material, the amateur also saves himself the cost and trouble of building a steam box, the investment in a lot of C clamps many of which he'll never use again, and the task of sweating over balky frames bending them into place. At a conservative estimate, the amateur builder can save himself at least 25% of the total cost of the hull and an equal amount of labor, by constructing a V-bottom boat instead of a round bottom type.

As far as the performance of the two types of boats is concerned, the V-bottom hull has several definite advantages, not the least of which is its ease of being driven through the water. This has been amply proven by the war record of the famous PT boats whose hulls were all of the V-bottom type.

In deciding on a particular design, the prospective builder should take certain facts into consideration. The first of these is that plywood cannot be used to plank a round bottom hull for the obvious reason that this material cannot be bent in compound curves unless it is shaped in a mould under heavy pressure and at high temperatures. The second point to remember is that some V-bottom designs embody compound curves and for this reason an existing design can't always be adapted to plywood planking. If you want to build a plywood boat make certain that it was designed for this material.

The simplest form of construction of course is the flat bottom boat shown in Fig. 5 and the photo. However, this type is only suitable for small boats on protected waters. When it is used in a larger hull or in a moderate sea it has a tendency to pound. Obviously for appearance, strength or stability it doesn't equal either the round bottom or the V-bottom type.

home appliance TROUBLE SHOOTER

Use this simple tester to track down shorts and open circuits.

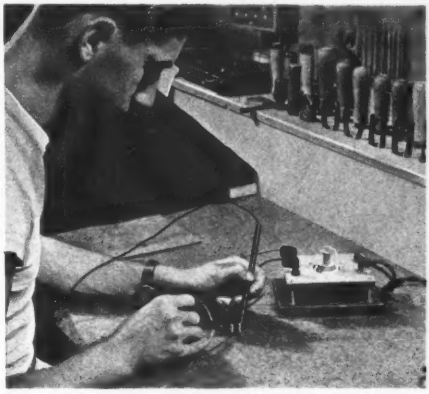
Completely assembled unit with adaptors for various tests. Letters refer to text.

FULLY 90% of the troubles that develop in irons, toasters, fans, lamps and other electrical accessories can be traced and identified with the handy test set shown in the photos. Made of standard radio and electrical parts, it can be assembled in about an hour and will prove highly successful in locating the most frequent faults in household devices.

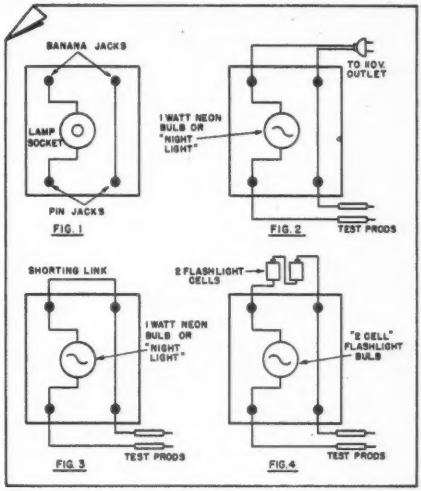
The test set consists of a porcelain or plastic light socket (for an Edison type base), mounted in either a shallow plywood or Masonite box measuring 4 by 5 by 2½ inches, or screwed to a small flat board as illustrated. On the upper part of the box top or board, two "banana jacks" are mounted on 2 inch centers while a pair of "pin jacks" are similarly installed on the lower edge. The socket and jacks are wired together following Fig. 1 in the drawing. The completed unit ready for testing is labelled A in the upper photo.

The external accessories or adaptors consist of the following parts: B—test cords with plugs and insulated test prods; C—lamp cord fitted with a 110 volt plug and banana plugs; D—two flashlight cells connected in series; E—reducing adaptor with a two-cell flashlight bulb; F—short-circuiting link equipped with banana plugs; G—one inch diameter neon bulb of the night-light type.

The outside testing hook-ups are shown in the drawing. These consist of: Fig. 2—When probing for shorts the bulb will light up, while on open circuits it will remain dark. Fig. 3—Determining if power line is alive. Fig. 4—Checking the condition of fuses.—*Robert Hertzberg*

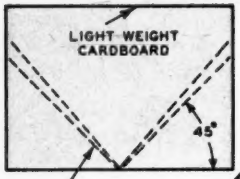


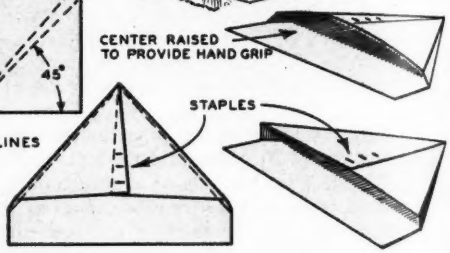
Testing the spark coil from a model gas engine. Below: Wiring diagram and external hookups.



THE NEXT TIME you have occasion to air your clothes on the clothes line, take the precaution of first twisting the line together. Remove the pulley at the window to do this. This will prevent the wind from blowing any of the hangers loose.

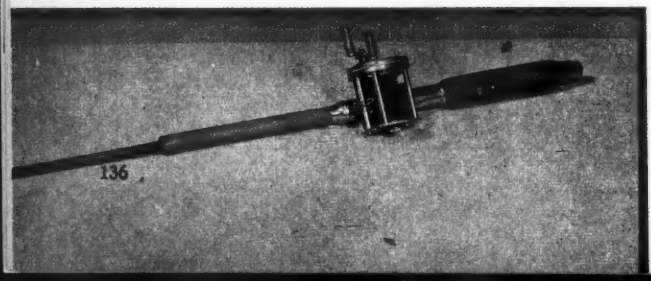
HOME HINTS





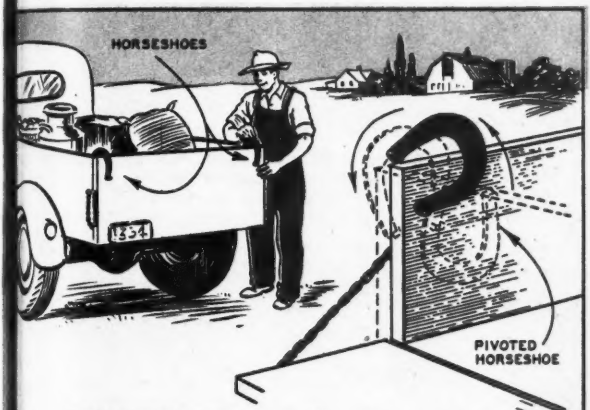
CARDBOARD DUSTPAN. A piece of lightweight cardboard, when folded in the manner as indicated in the sketch, will make a very good dustpan. The size of the cardboard should be about 8x10 in., such as that used to back up a typewriter tablet.

ADDRESSING KINK. After you have wrapped up a rolled newspaper or magazine for mailing, addressing it will be a simple matter if you rest your hand on a book as shown. Thickness of book required will be determined by the height.

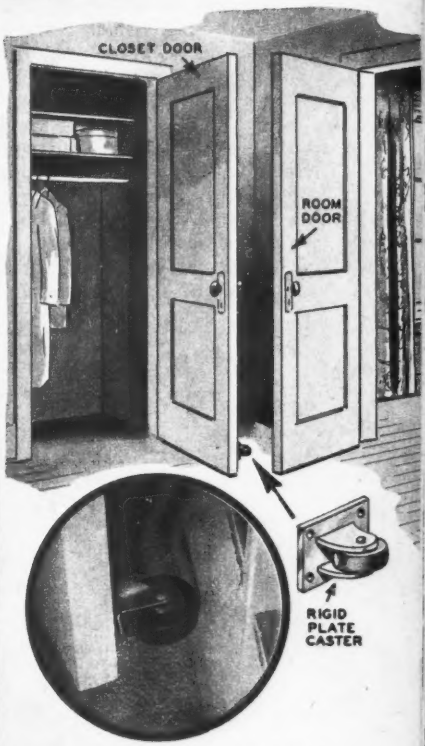


FISHING ROD HANDGRIP. Most tubular steel fishing rods offer a poor grip to the left hand. This fault can be remedied by cutting a piece of hose and slipping it over the rod next to the handle.

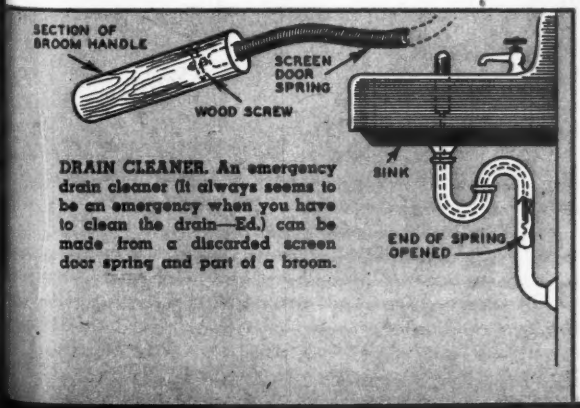
HERE I AM. When the lights blow, is the time you need a flashlight in a hurry. A small "radium" light tab, available from the five-and-dime, makes an effective telltale. Drill and tap the end of the cap to take two small bolts to attach the tab.



TAILBOARD LATCH. A pair of horseshoes, mounted as shown, were used by one farmer in Wisconsin, to secure the tailboard of his truck. They are pivoted in the inside to engage the tailboard.



NON-JAMMING DOORS. Bad architecture and makeshift corrections often lead to doors that jam up against each other. Eliminate this interference by mounting a small caster at the bottom of the door so that the wheel rides over obstructions.



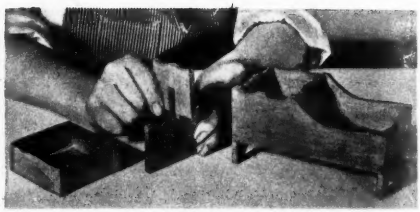
DRAIN CLEANER. An emergency drain cleaner (it always seems to be an emergency when you have to clean the drain—Ed.) can be made from a discarded screen door spring and part of a broom.

miniature TABLE TRAY

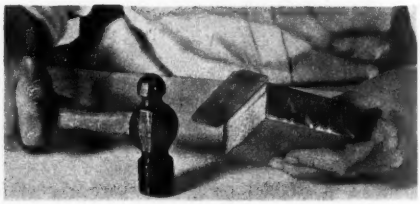
A replica of the old-fashioned blacksmith's kit serves as a silent host at the table.

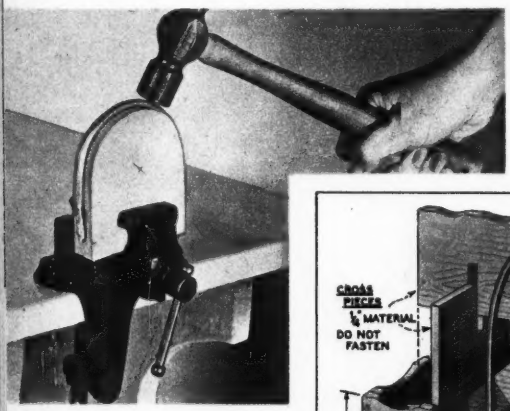
THIS tiny model, whose original was toted by the village blacksmith, will add just the touch of informality the modern hostess wants at her table to put her guests at ease.

The dimensions of the kit are given in the sketch below. The parts can be shaped with a penknife. Minor irregularities, within limits, are acceptable for they imitate the battered hand hewn original. Assemble the parts with nails but do not nail in cross partition. Photo at right shows the construction of tray.

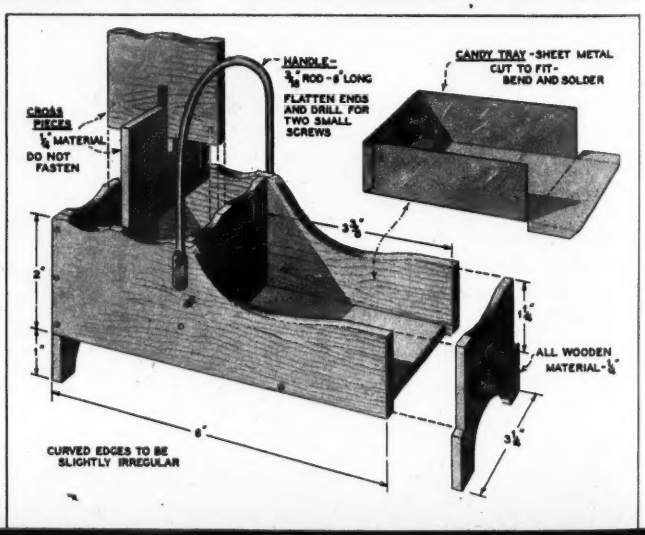


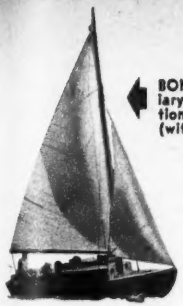
Top: The cross partition should not be nailed in place as the usefulness of the tray is increased if this member can be removed at will. Below: The metal ash tray is formed over a block.





Handle is made by bending a rod over a block of wood. Hammer ends flat and drill small holes for the screws.





BONNIE, 18' V-bottom auxiliary sloop. Plywood construction, seaworthy. No. 944, $3.00, (with full-sized patterns, $7.00).

SNUFFY, 12' plywood car-top utility outboard. Lightweight, strong and durable. No. 955, $1.50.

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FLYER, 12' outboard utility. Uses 1 to 10 h.p. engine, does up to 20 mph. No. B-142, $2.00.

TESTED BOATS

Scale Blueprints

MALLARD 14' plywood hunting or fishing boat. Page 122. No. B-143, $1.00

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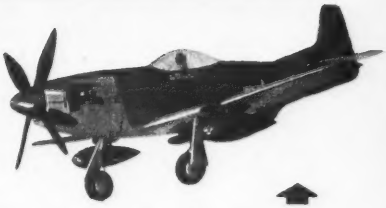

P-51H MUSTANG, 32-in. control-line job features removable landing gear, take-off dolly. Realistic, easy to build and fly. Plans, instructions, No. 364, 50c.

TIGERCAT, 36-in. control-line fighter. Flies on either engine. Good club project. Plans, instructions. No. 366, 50.

VOYAGER 150, 30-inch scale rubber powered model of the Stinson lightplane. Plans, instructions. No. 368, 50c.

NAVION, 36-in. scale control-line model of North American's new lightplane. Simple construction, tricycle landing gear. Plans, instructions, No. 369, 50c.

MI BIPE

FULL-SIZED plans of the control-line gassie appearing on pages 116-119. No. 371, 50c

SNOOTIE, 40-in. Class A free-flight contest job designed for the Arden .099 power plant. Complete plans and instructions. No. 370, 50c.

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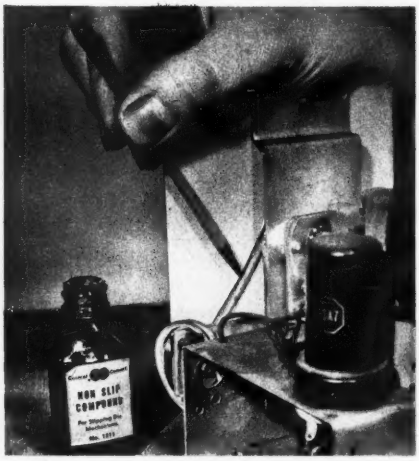
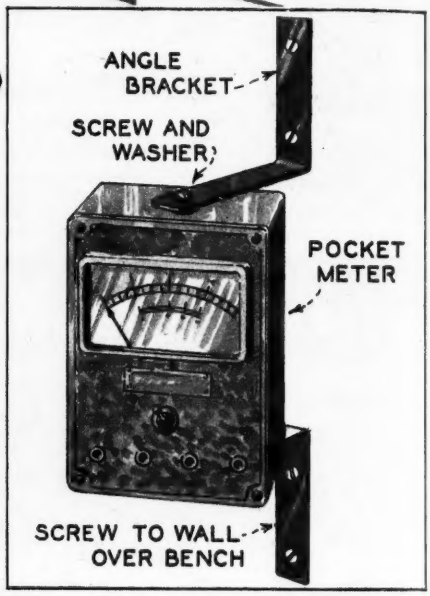
11-48

The plans listed on this page are only a few of the many MI publishes. Send a 3c stamp for the 60-project MI BLUEPRINT BOOKLET.

RADIO Ideas

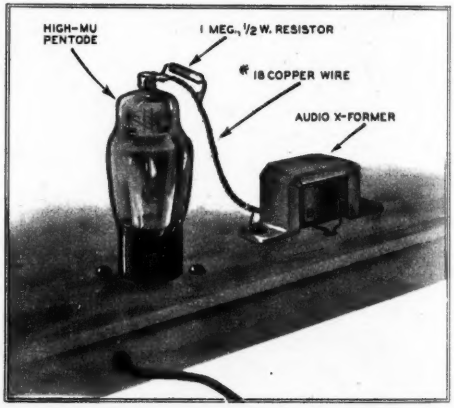
A SWINGING METER MOUNT that will prolong the life of pocket size volt-ohmmeter can be made from two angle brackets. This enables the meter to be read from any position and removes it from the bench top, away from tools.





DIAL CORDS THAT SLIP can be repaired by simply applying a special compound made for this purpose and available at most radio stores. The non-slip compound should be permitted to thoroughly dry before turning the dial of the set.

MOVING HAM SETS that contain heavy transformers, is a push-over if you mount small plate casters in each corner of the chassis as shown. With these, you can change connections or make adjustments without marring the workbench top.



STOP THAT AUDIO WHISTLE without shielding, by using this arrangement. With it, the feedback whistle caused by using a high-mu pentode with an audio transformer on a non-metallic chassis will disappear completely. If the whistle persists with the 1 megohm, resistor, substitute a lower value. Connect the transformer case to a regular ground.

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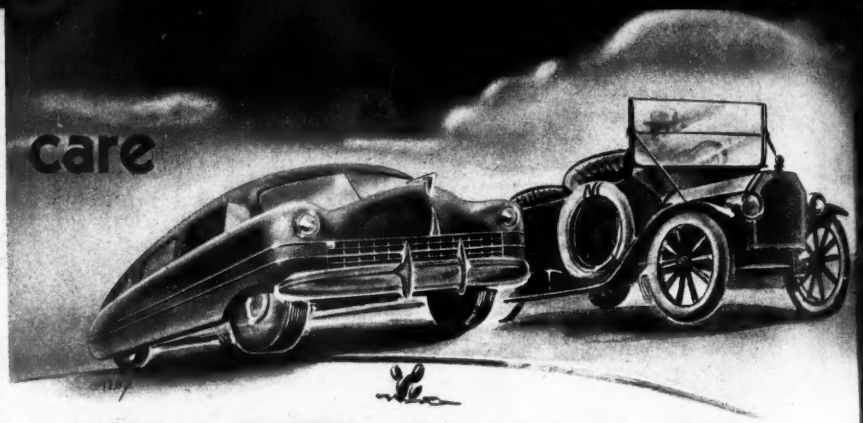
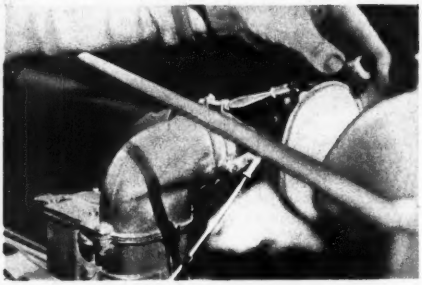
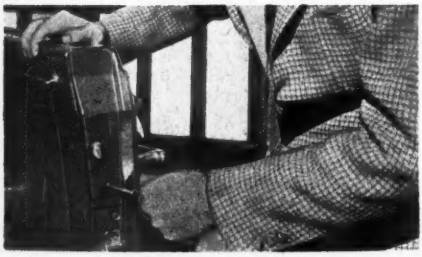


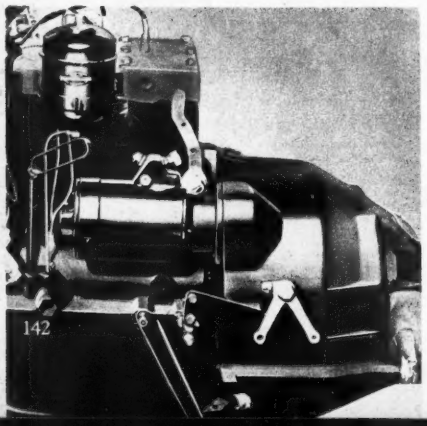


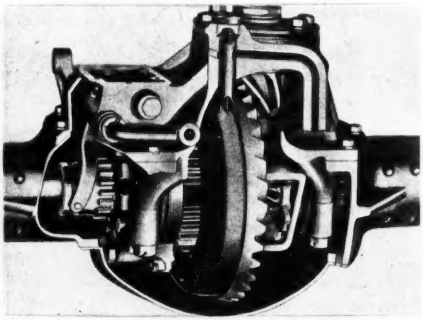
BORROWED TROUBLE still seems to be a popular habit among those motorists who aren't satisfied with the usual ailments. Reader B. N. D. found a flat spot on the ball valve of the oil pressure relief device so he replaced it with a perfectly round ball. He did not know that the flat spot was intended to permit the valve to allow a little oil to flow even when pressure was at a minimum.

A LEAN CARBURETOR MIXTURE can be just as bad as a too rich setting. It will cause overheating and burned valves at high speeds. Below: LOOSE DOOR LATCH PLATES not only encourage rattles, but sagging doors as well. Tighten them and finish by touching up all friction parts with a non-soiling grease stick.



WATER IN THE CLUTCH or on its housing may hint of a cylinder head gasket leak or a loose motor block core plug, but there's no need to be mystified if neither of these conditions is found. Look up higher to where the underdash heater hoses connect with the heater core. A leak there may explain the presence of the misplaced water.





Top: TWO-SPEED REAR AXLES include many parts found in the transmission and for that reason they should be treated to a flushing every 5,000 miles. Left: A LOOSE STARTER MOTOR is an invitation to burred teeth on the flywheel ring gear. Make sure the starter drive gear is in line with the flywheel gear to avoid this headache.

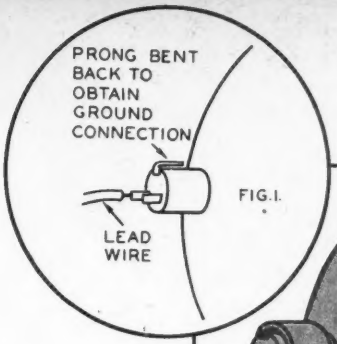


FIG. I.

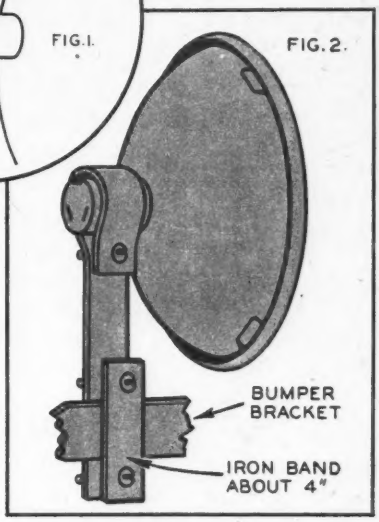


FIG. 2.

BY FREDERICK C. RUSSELL

A feature of Car Care has been Mr. Russell's diagnoses of automobile ills. This has been carried on in the form of a correspondence between the reader and Mr. Russell. The Editor, realizing that many of the complaints received by Mr. Russell are common to other cars, and of interest to other readers as well, has decided to publish as many letters as space permits each month in a new department called, Under the Hood. Let us know how you feel about this new feature in MECHANIX ILLUSTRATED. Remember, you can still get a personal reply from Mr. Russell. Just send him a stamped self-addressed envelope with your letter.

UNDER THE HOOD

Can you please tell me what is wrong with my 1930 Oldsmobile Six? The car runs fine except it is very sluggish in first gear. I have put in new rings, piston pins, and ground valves. The spark seems to be OK. Charles Duane, Corona, New York.

Sluggish action of your car in low gear is probably due to worn transmission bearings. The engine then seems to be working harder than it really is and the sluggishness is largely psychological.

Every head gasket I replace on my 1934 Chevrolet seems to leak water. Can you tell me what the trouble is? William Lytle, Portville, New York.

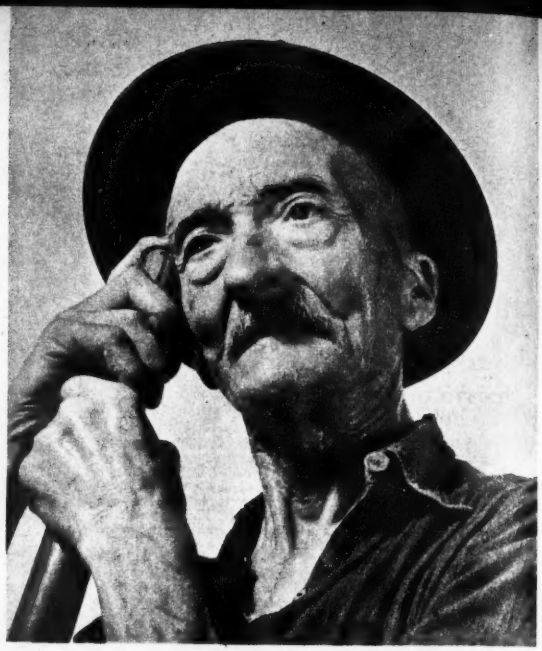
Your leaky gasket is probably due to a warped cylinder head or engine block.

I have installed what seems to be a new carburetor in my 1935 Ford V8, yet in spite of this I can't get good acceleration. Sometimes the car responds and other times it won't. What's wrong? Thomas Ward, Oakham, Mass.

The lack of acceleration is probably due to the carburetor float level being too low. This has the same effect as starving the engine by allowing it, temporarily, to have too little fuel.

BACK-UP LIGHT. A partly burned out sealed beam unit need not be discarded for it can be converted into an efficient back-up light. Use a switch with a pilot light at the dash so that you won't forget to turn off the light when it is no longer needed.

LEAKY TRANSMISSIONS are a fruitful source of gear trouble. Be sure that the filler plug is properly replaced after the transmission has been checked at the station.

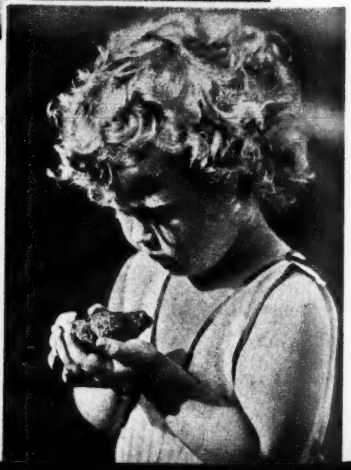


First Prize, $10.00.....Laborer
A character study by Paul Gavin, Arlington, Mass. Taken with a 4x5 Speed Graphic.

Color Photo Contest closes on November 30th. See page 160

$5.00 Award.....Don't Fence Me In
Charles Rose of Detroit took this one on Verichrome film, 1/100th at f-5.6, DK-20.

Pillars of Justice. A $5.00 Award winner by Ernest Palinkas of New York City. Super XX film.



Miss Curiosity. A $5.00 Award winner. Taken by Paul Hadley, Philadelphia, on a 5x7 view camera, ortho film.

Cash From Your Camera

A way to make some money from your favorite hobby.

BY FRANK W. COLLINS

HERE'S a brand new approach to an idea that will net you a cash return on your camera and enlarging equipment. Select a good bright morning when car parking is at a minimum and take along enough film for 20 or 30 shots. Within two hours you should be able to photograph at least 30 business premises such as gasoline filling stations, restaurants, hot dog stands, store fronts and other places of business lending themselves to a quick picture.

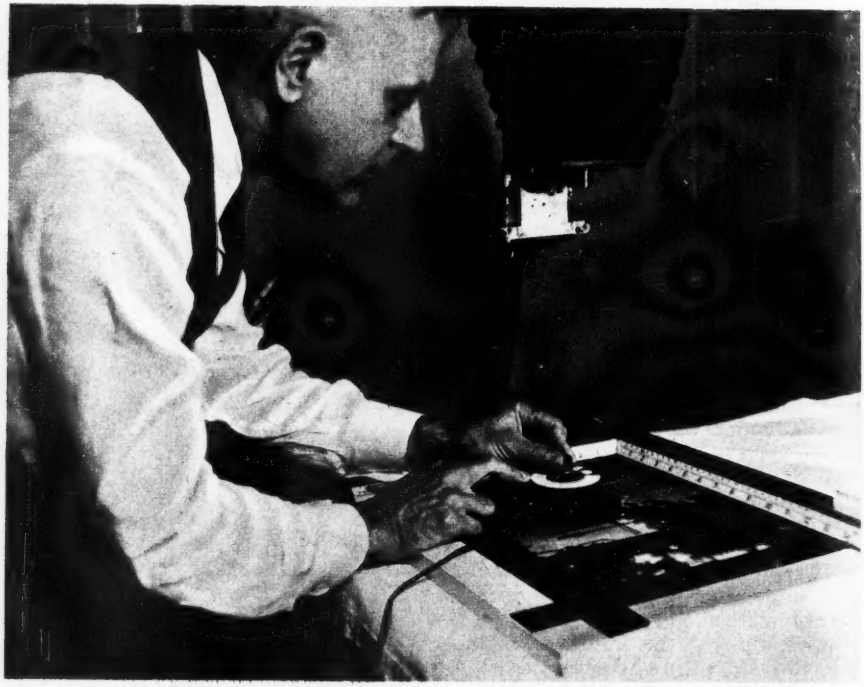
Next, develop the film, and print 8x10 enlargements of each shot. Place the finished pictures in a simple mount. Then call upon the owner of each place photographed. *No sales talk is necessary,* simply hold the mounted 8x10 picture before the proprietor and state that it is his for $1.50.

You will be surprised at the response. In 19 cases out of 20 the owner would have turned down any proposition to have his place photographed regardless of price, but with the finished picture before his eyes he just about breaks his arm getting money out of the register.

The author took 182 shots, enlarged 162 and sold 158.

Test strips - - time-honored time-consuming darkroom standbys are virtually eliminated with this device.

No more test strips



BY LOYAL S. FOX

ISN'T it inconsistent to take your pictures with the help of a photoelectric exposure meter and then to make the prints by means of trial and error under the enlarger? An enlarging meter, however, enables you to select the right grade of paper as well as the correct printing time, without any test strips.

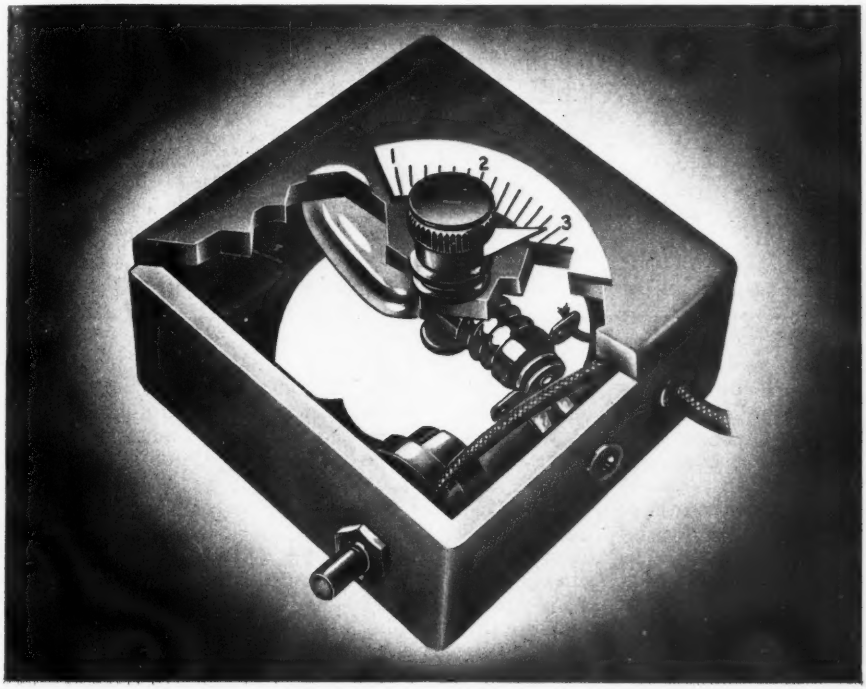
A print meter, or enlarging meter, is not too difficult to build and a dollar should cover the cost. The meter to be described makes use of a simple principle. The light on the easel varies in proportion to the densities of the different parts of the negative. Within the meter is a light which can be varied by turning a knob. When this is set

so that the meter light matches the light through the negative, the dial reading is a measure of the negative density at that point.

The case is just a simple woodworking job. The spiral disc is laid out by first prick-punching for the center. Then, using a protractor, lay out the radii at angles as shown in Fig. 3. Next scribe with dividers the arc of each circle where it crosses the radius. Now, using a French curve, connect these points to form a smooth spiral. Cut out slightly oversize and file to size.

The aperture is shown in cross-section in Fig. 2. The ¾ in. square piece may be made of wood or bakelite. First scribe the ¾ in. square then drill with a No. 18 drill, countersink, and then cut out the square. Glue this piece to the underside of the case top so that the hole lines up with the aperture hole. Cement to this piece a square of white translucent celluloid to cover the hole. A good material to use can be cut from one of the leaves used for Eastman spotting colors. Assemble the spiral disc on a machine screw shaft so that the spacing between the disc and the ¾ in. square piece is exactly $\frac{1}{16}$ in.

Mount the lamp socket so that the tip of the lamp does not quite touch the inside of the case. Make sure that nothing interferes with free rotation of the disc.



A cut away view of the completed enlarging meter showing all the components; the scale may have to be shifted.

Cut out and bend the sheet metal bottom piece until it fits snugly inside the case. The hole in the bottom is for removal.

For the filter and aperture refer again to Fig. 2. On the bottom is another piece of the translucent celluloid, same as used inside, cut to ½ in. diameter. This piece is painted on one side with a turquoise shade water color. The purpose of this color is to filter out the excess red portion of the light, so that the light will appear white to match against the white background. This disc goes next to the case, with color side up. Above this is a disc

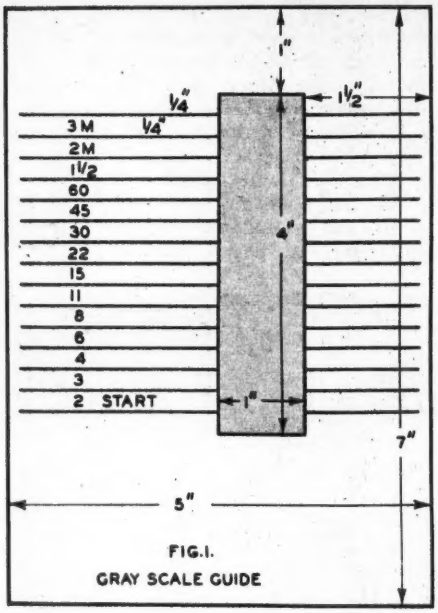


FIG.1.
GRAY SCALE GUIDE

THE QUESTION BOX

by Robert Brightman

Photo fans! Use this column for answers to any of your problems on photography. If the question involves a print fault please include the print with your letter (and postage for its return).

I have a camera marked Zeiss Ikon with a Novar lens and a Telma shutter. Can you tell me the approximate price of this camera, where it was made and whether it is adaptable for flash? Francis Mosel, San Antonio, Tex.

This camera was made by the Zeiss Company of Germany for European distribution. It is worth about $25 and is not adaptable for flash synchronization.

What is wrong with the enclosed negative and print? Robert Foster, Carrizo Springs, Tex.

Your negative is suffering from nothing else but plain old-fashioned camera movement. The print turned brown because you kept it in the hypo too long. A strong hypo solution acts as a bleach and will exhibit the effects shown. The gray specks and spots are fingerprints, probably caused by your hypo-contaminated fingers affecting the paper prior to exposure or development.

I am making the Jiffy Slide Printer described in the August issue of MI. Can you tell me where I can buy the safety positive film mentioned? M. O. Williams, Auburn, Ala.

This film is available from the Eastman Kodak Company. It is known as P-402 and sells for $1.90 plus taxes.

of film negative, and on the top a disc of white cardboard with a small hole punched in the center. The disc of film negative can be cut from a discarded negative, the proper density will have to be determined by trial. Switch the meter light on and turn the disc until the light through the aperture is as dim as possible. Try different parts of negatives, until you find a density that makes the light through the aperture barely visible in a completely darkened room. Now cement the three discs together at the edges and then cement the assembly on the case, centered over the aperture hole.

Next, cut out the pointer and assemble it with the knob on the shaft. Finally, the temporary dial. Lay out the graduations with a protractor and number them as in Fig. 4. The markings may have to be changed later. Cut out, and attach to the case. Now your meter is practically complete except for calibration.

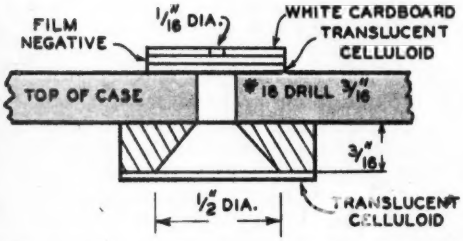


FIG.2. SECTION THRU A-A, FIG.1. SHOWING DETAIL OF APERTURE AND FILTER

CALIBRATION. The principle on which a print exposure meter operates is simple. Exposure to the light passing through a negative for a given length of time will produce a given shade of gray on the paper. The formula is: *Light x Time = Gray Shade.* To calibrate our meter we shall need a gray scale. It is simply a strip of the paper, showing, in a series of steps, the shades from the lightest gray to the darkest black resulting from increased exposure. Adjust the enlarger so that the light on the easel is quite dim. Measure the light with the meter, turning the knob until the aperture appears identical with its surrounding disc and seems to disappear. Cut a piece of enlarging paper about an inch square. Remove the meter and put the paper in the same spot. Put a coin on top of the paper and expose for eight seconds. Develop for full time

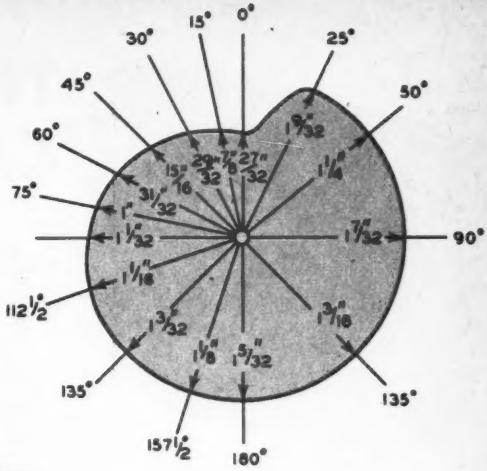
and fix. If the paper shows a shade of gray which is just discernable the test is finished. If not, repeat with more or less light as required. Make a note of the exposure time and the meter reading.

Now you are ready to make the complete gray scale. First, make a guide, as shown in Fig. 1. As all our gray scales are to start with a two second exposure, it is necessary to set the enlarger light for that exposure. For example, suppose that in making the test for the first gray shade the light measured 60 and the time was eight seconds, then the light for a two second exposure will be set at 15. The formula is:

$$\frac{\text{Light (60)}}{\text{Time (8)}} = \text{Light (8)} \times \text{Time (2)} = \text{Light (15)}$$

(15 is the nearest number on the scale)

Set the meter at 15 and adjust the light to match. Now cut a strip of enlarging paper about 1 x 4 in. Attach



NOTE:
THE RADIUS CHANGES 1/32" FOR EACH ANGLE

#18 DRILL HOLE IN CENTER

FIG.3. LAYOUT OF SPIRAL DISC.

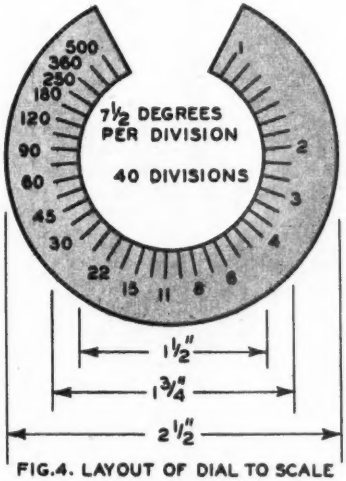


FIG.4. LAYOUT OF DIAL TO SCALE

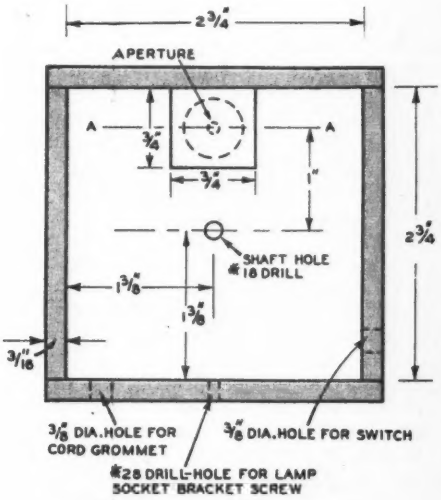


FIG.5 BOTTOM VIEW OF CASE TO SCALE

this to the guide with a bit of scotch tape. Place the top edge of a card on the "start" line. Switch on the enlarger light and start counting seconds: "One thousand—two thousand—three thousand" and so on. At two seconds cover the space marked 2, at three seconds move up to cover space 3, and so on until the three minutes mark. After completing the exposure, develop, fix, wash and dry. If you are making several gray scales at one time, be sure to put some identifying mark on the back of each before they go in the developer. Now you will have a scale of 14 steps ranging from the light gray to deep black, each a little darker than the one below, and all displaying the characteristics of the paper.

Mount the gray scale with the light end down on a piece [*Continued on page* 160]

TIN CAN CAMERA CASE

BY ROBERT SCOTT

Transforming the lowly tin can into a trim and compact ever-ready camera case.

A Zeiss miniature safely cradled in its ever-ready camera case.

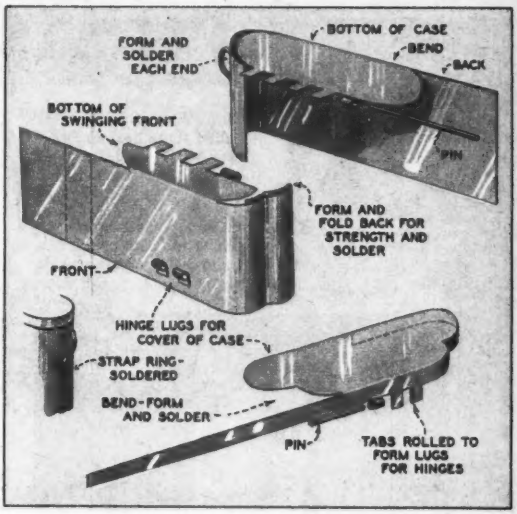
AN EVER-READY case is the best means of protecting your miniature camera from the scuffs and bumps of ordinary use and from accidental damage and loss. The case shown is made entirely of tin can metal, coated on the outside with automobile enamel. It is designed to fit the camera snugly. The camera can be used without removing it from the case by opening the front. With the shoulder strap (or cord) around your neck, there is no danger of dropping the camera.

Leather ever-ready cases generally cost from about $3 to $10 and are much thicker and less compact than a metal case. Aside from a small amount of enamel and a little solder, material for the metal ever-ready case costs nothing. Tin snips or heavy scissors can be used to cut the metal to pattern. The two hinges on the metal case allow the front to be opened permitting free access to the camera and its controls.

The case consists of three sections; the main body which fits around the camera, the front section, and the lid. The drawing shows the type of pattern used to make each of the three parts. Exact dimensions of the parts will depend on the size and shape of your camera and the location of the controls. The camera shown has a lever on the front for rapid film transport. To allow room for the swing of this lever the case has a wider opening at the front than would be necessary for the average camera.

An easy way to make the patterns for the three parts is to lay them out on typewriter paper, using your camera as a guide. If you intend to line your case with

Use your own camera to supply the dimensions.



felt it will be necessary to make allowance for the space it will occupy. The felt lining is not necessary. In the case illustrated, the inside, which contacts the camera, was rubbed to a satiny smoothness with fine emery cloth. The inside of the main body of the case was left unpainted. The camera fits snugly but it can be removed and inserted without scuffing its finish. All exposed corners and edges of the metal were rounded with emery cloth.

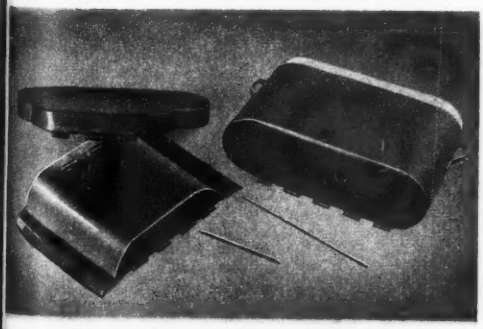
MAIN SECTION: The main body of the camera was made of double thickness for strength. This was done by adding two re-enforcing pieces after this section had been completed. One piece was cut to fit neatly inside the vertical part of this section and the other was cut to fit in the bottom part. Soldering the two extra pieces in place greatly increases the rigidity and strength of the case. Remember to allow for them when laying out your pattern.

HINGES: Another thing to remember in laying out the pattern is the tabs which will be rolled into tubes to form the hinges which hold the sections together. These tabs are about ¼ in. square and are cut so they fit together like the pieces of a jigsaw puzzle when the two sections are held together. Two straight lengths of steel wire, about the diameter of paper clip wire, make good hinge pins.

CUTTING: When the pattern of the main body of the case has been completed on paper, cut it out carefully with scissors and fasten it to a strip of tin can metal with rubber cement or other adhesive. Now cut the metal to pattern with tin snips or heavy scissors. A two-gallon oil can provides a good source for the metal because of the large flat pieces which can be cut from it.

It is a good idea to complete the main body of the case before you even make the pattern for the front part or the lid. When the main body has been cut to pattern it is bent at a 90° angle along the line shown in the drawing and soldered where the sides [*Continued on page* 160]

Components of the case before assembly. Steel wire is used for the hinge pins.

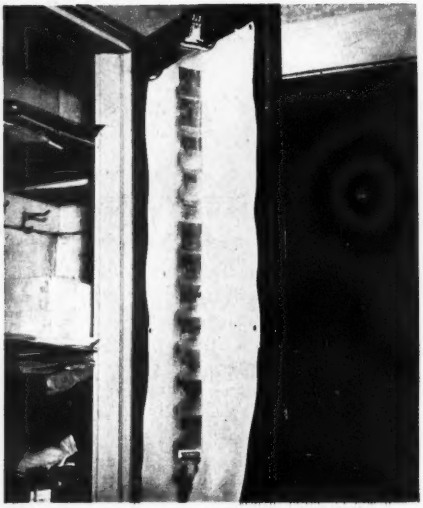


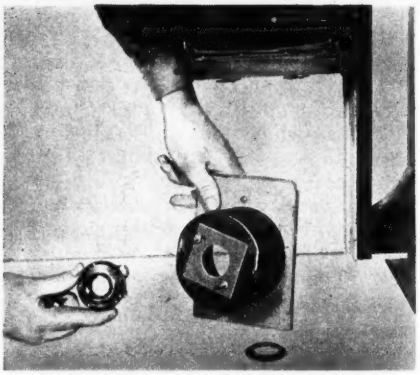
A rear view of the opened case. Neck cord clips to rings at side of case.

PHOTO KINKS

Right: Three orange crates nailed together make a useful cabinet for paper, chemicals and trays.

Below: For dust-free drying of roll film or cut film hang the film on the inside of a closed closet door.





Glass containers make handy graduates when labeled as shown. Use the top edge of the tape for the measuring level.

Top: If you are unable to use a short focal length lens in your enlarger because you cannot bring the lens close enough to the bellows, mount the lens on a small platform built on the lens board.

Left: The hard rubber GI footbath basin being sold as war surplus material, makes an ideal tray for a hypo bath or for washing.

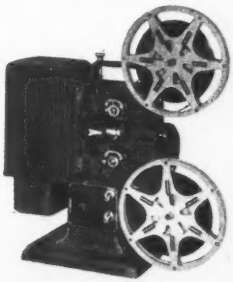
Designed right, to delight the most critical hobbyist

Ciné-Kodak Magazine 8

In this compact home movie camera you'll find the things you appreciate—sound design, simplified operation, the balance and "feel" of quality, combined with true film economy. Three-second magazine loading with full-color Kodachrome or black-and-white films; *Lumenized* $f/1.9$ lens; six accessory lenses; four operating speeds, including slow motion; Universal Exposure Guide.

Ask your Kodak dealer, too, about the economical Ciné-Kodak Eight-25—roll loading; with fixed-focus *Lumenized* $f/2.7$ lens, full-vision eye-level finder, footage indicator, Universal Exposure Guide. Ask about the popular "Magazine 16," too . . . Eastman Kodak Company, Rochester 4, N. Y.

Carrying Cases—Wide choice of cases for Ciné-Kodaks, film, accessories. Handsome, durable . . . complete protection for all your movie-making equipment.



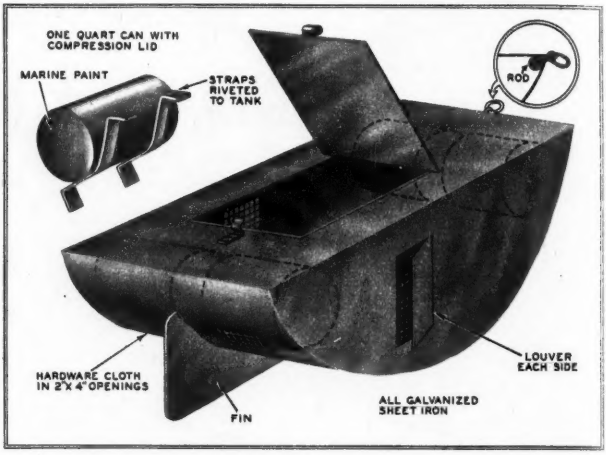
Kodascope Eight-33—Fast $f/2$ lens teamed with 500-watt lamp gives brilliant image on screens up to 30 x 40 inches. Finger-tip tilting, threading, framing . . . major operating controls grouped on centralized panel.

Ciné-Kodak Long-Focus Lenses "bring it up close." Above, from left to right, (1) taken with standard 13mm. lens, (2) 25mm. lens, (3) 50mm. lens.

Kodak

Live Fish STORAGE BOX

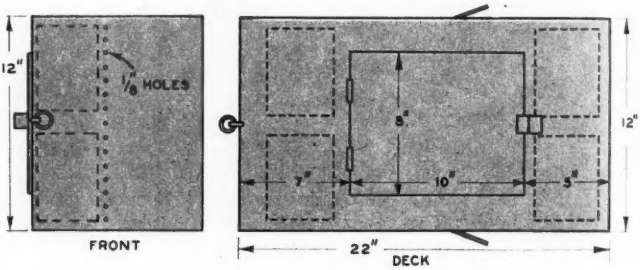
Bring 'em back alive with this tow-tank for your boat.



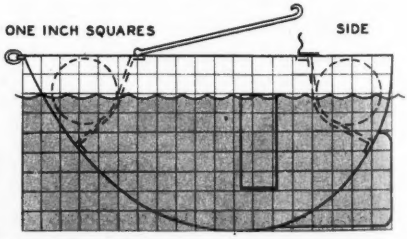
IZAAK WALTON would have given his eyeteeth for this fish carrier but it's yours for a short session with tin snips and a soldering iron. Large enough for five-pound bass, the box is made of light-gauge galvanized sheet metal with tin can floats.

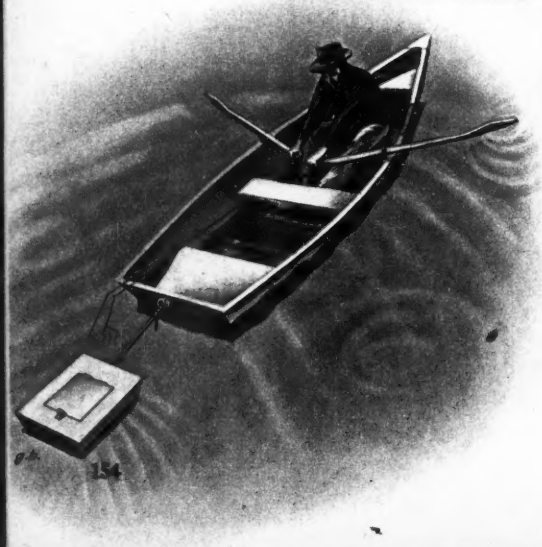
Your initial step is to solder galvanized strips on the clean paint cans and solder the compression lids on. Follow this by giving the cans a coat of marine paint.

While they're drying, cut the sheet metal parts to shape and drill the holes at the forward end of the bottom. The openings for the hatch and louvers at sides and stern are made next. The bottom piece is then bent to shape and the screens soldered behind all louvers. Deck and bottom pieces are soldered together, the towing hook added and the floats installed by riveting the straps as shown. Solder the sides and fin in place and install the hatch cover and latch. A coat of yellow marine paint will increase the visibility of the box when it's afloat.—*Hi Sibley.*



Holes in the bow permit the flow of water. Fin prevents wobbling.





"How many cylinders should an outboard have?"

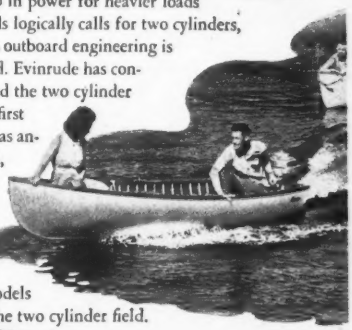
Of course there is much more to an outboard motor than cylinders and pistons. But the *number* of cylinders does have a lot to do with smoothness, flexibility, power, *performance!* When you come to choose your new outboard motor here are "cylinder facts" worth remembering!

ONE CYLINDER IS FINE . . .

For small outboard motors, where light weight and handy portability are prime considerations; single cylinder construction is highly satisfactory. Single cylinder design has come a long way since Ole Evinrude "started it all" back in 1909, and Evinrude's highly developed "Ranger" and "Sportsman" are favorites with outdoor folks everywhere.

TWO CYLINDERS . . EXCELLENT

The next step up in power for heavier loads and higher speeds logically calls for two cylinders, which is as far as outboard engineering is ordinarily carried. Evinrude has consistently advanced the two cylinder design since the first Evinrude twin was announced in 1915, and Evinrude's "Sportwin" and "Speeditwin" are today two of the most popular models in the two cylinder field.



AND FOR TOPS IN THRILLING PERFORMANCE—

CHOOSE A "FOUR"

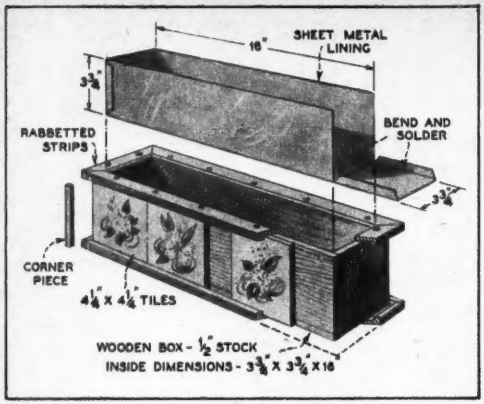
Tens of thousands of enthusiastic owners will tell you, "For tops in performance and pleasure — own a four". Only Evinrude offers four cylinder outboards, and Evinrude builds with a background of 18 successful years in perfecting these superbly smooth and spirited motors. Four great "fours"* to choose from — two of them smack in the range of two cylinder power, weight, price!

See your Evinrude dealer — look for his name in your classified phone directory under "Outboard Motors". Complete catalog of 8 Evinrude models sent free . . . address EVINRUDE MOTORS, 5373 N. 27th St., Milwaukee 9, Wis.

In Canada: Evinrude Motors, Peterboro, Ontario.

EVINRUDE
OUTBOARD MOTORS

**Motor shown is the "Lightfour". 66 lbs., 9.7 O.B.C. brake horsepower at 4000 R.P.M.*



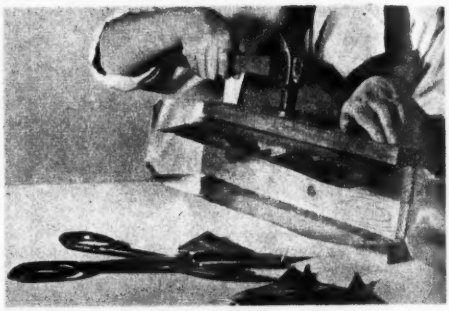
tile covered FLOWER BOX

This novel setting for indoor gardens uses colorful decals on dime store tiles.

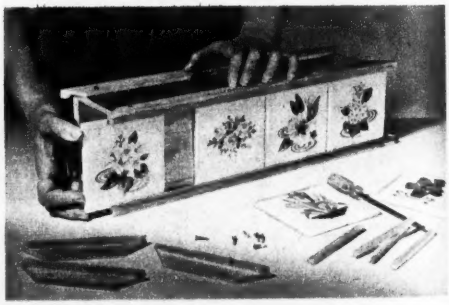
WHILE the hardware store variety of metal flower box is practical, its drab appearance usually banishes it to outside window sills. And yet as these photos amply prove, a metal lined box can be attractive as well as low in cost.

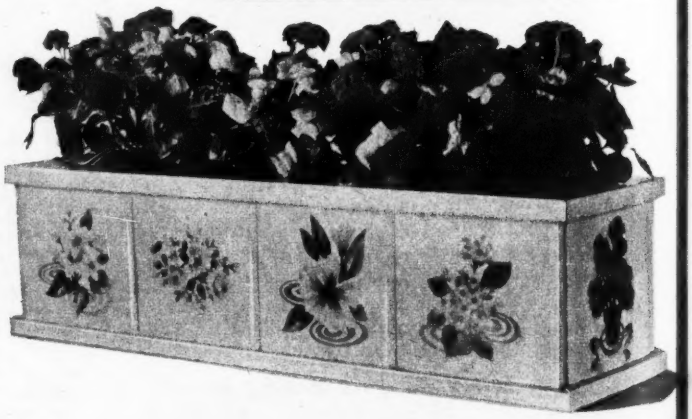
You can start the ball rolling by making a wooden box to fit the size tiles you plan to use. Those used on the box illustrated were 4¼ in. by 4¼ in. in size, with four tiles on each side and one tile on each end. The dimensions of the box in the drawing were calculated accordingly. Wooden strips either rabbetted out or built up are used to hold the tiles in place.

The metal lining is made from sheet copper or galvanized iron, cut to the shape shown in the drawing. An easy method of bending it is demonstrated in the upper photo. Here, two blocks that fit loosely in the box, form a sandwich with the metal between them. They are screwed together and the metal bent up over the sides and ends. The seams are then soldered and riveted and the screw holes filled. The only finishing you have to do on the box, is to fill the screw-heads in the strips and then paint them to suit your decorative scheme.

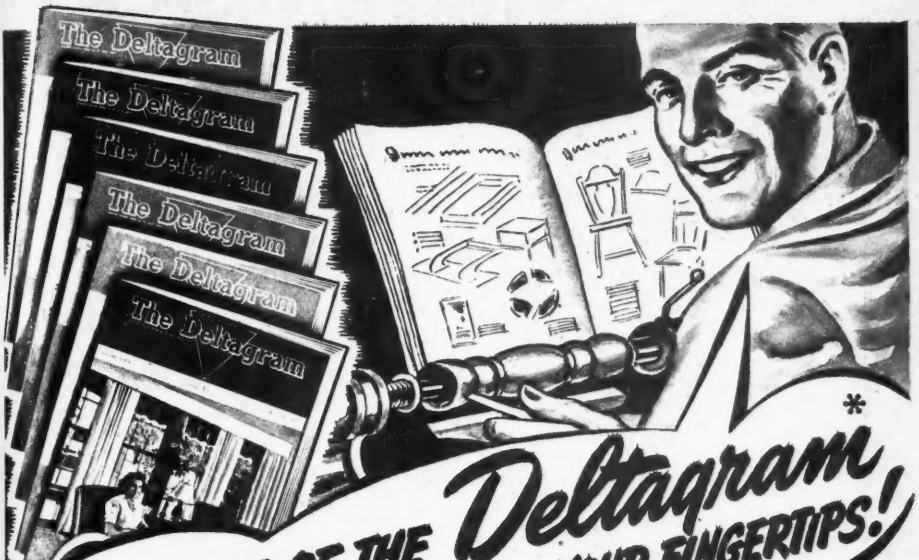


Bending sheet metal lining to shape. Below: Sliding decorated tiles in place.





Filled with flowering plants, the finished box is useful indoors or out.



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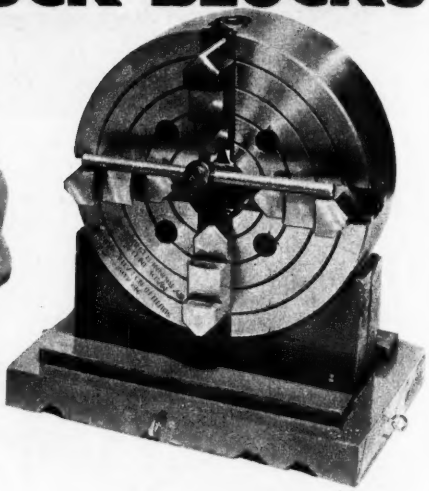
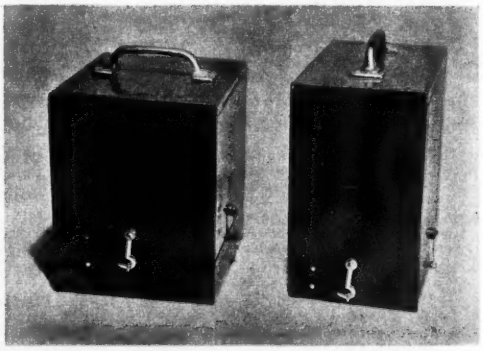
CHUCK BLOCKS

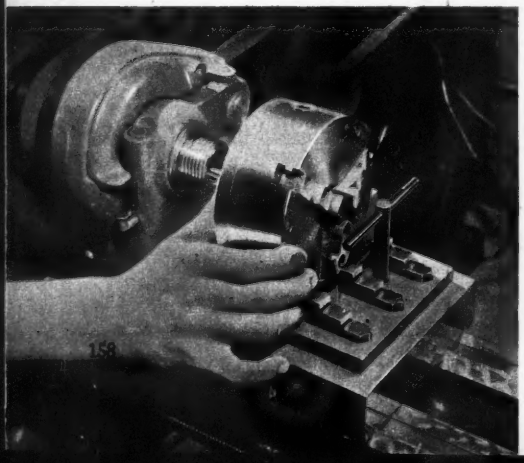


BEING round, heavy and slippery, lathe headstock chucks of the three and four-jaw type are awkward to handle when they are being mounted or removed from the spindle. After having a brand new six-inch chuck roll off the bench and nearly mash several toes, the combination box-blocks shown in the illustrations were built. They cost practically nothing and have proved extremely useful.

Scrap wood is used throughout. Make the baseboard first, grooving the bottom to fit the lathe bed. Cut a separate arc-shaped section of wood to fit the curvature of the chuck. Mount the latter on the spindle, push the baseboard and the arc section under it, and shim up the latter with plywood and cardboard until it is a snug fit; then fasten it in place permanently. The cover is merely a box.

The blocks shown are for a South Bend 9-in. lathe but the idea can be used with any size chuck.—*Robert Hertzberg*





Above: The snug covers protect the chucks inside from chips and dirt. Box at left contains a 3-jaw, one at right a 4-jaw. Left: The danger of dropping a chuck is eliminated by this sliding block arrangement. Right hand merely guides chuck against spindle while left hand pulls belt slowly. Below: Details of the 3-jaw chuck block. Cut-out compartments are for extra jaws, hole is for key. Grooves on underside fit bed ways.

The Ernest Babcocks, Junior and Senior, model plane speed champs from Morris Plains, N. J. Here in their home workshop, tinkering with their stubby Class C model "Jughaid" (Yep, made with an X-acto!) which in unofficial practice flights has made as much as 130 mph.

MEET THE CHAMPS...THE BABCOCK TEAM

...and read what *they* say about X-acto!

When thirteen-year-old Ernest Babcock asked his Dad for a model plane kit four Christmases ago, he got an X-acto Knife Chest, too. But, neither father nor son dreamed, then, that they'd become the nationally famous model plane team they are today.

Dad designs the planes, Junior flies them, but *both* work at building them with their trusty X-actos. Together, the amazing Babcocks have broken more records and run away with more top prizes than most ordinary mortals ever heard of.

Anyone who ever put a knife to wood knows a brilliant record like this takes more than expert skill in designing and handling the planes. It takes the patience of a saint in building accurate models. And it takes good, dependable tools.

So when the Babcocks say, "We've used X-acto Knives since we first began building models, and find them *the handiest tools to have in a model shop*"... there's a tip for *you*, brother!

13 Blade Shapes Quickly Interchangeable!

X-acto is tops, as well, for whittlers, paper sculptors, or any other hobbycrafter, be he amateur or expert. With 13 scalpel-sharp blades and 3 safety-grip handles (*all-metal, no more substitute plastics!*) you'll do a slicker job, and *quicker*, when you use super-sharp X-acto.

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X-acto No. 2 Solid Duraluminum Knife . . . **50c**
With 5 assorted blades, $1. Other X-acto Knives, Tools, Chests, 50c to $12.50.

Hobbycrafter's Dream Gift. No. 85 X-acto Tool Chest—3 all-metal knives; full assortment of blades; saw; sander; stripper; planer; drills and holders; steel ruler; complete in wooden chests, $12.50.

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X-acto Crescent Products Co., Inc., 440 Fourth Ave., New York 16, N. Y. In Canada: Handicraft Tools, Ltd., Hermant Bldg., Toronto

*Reg. U. S. Pat. Off.

Color Photo Contest Rules

1. Contest is open to everybody, except employees of Fawcett Publications and their families.
2. Transparencies or color prints of any type or size are eligible. If a color print is a prize winner, transparency must be available at request.
3. Entries should be securely wrapped, labeled with return address and accompanied by return postage. Picture-taking data must be enclosed for each entry submitted. All entries will be returned, but MECHANIX ILLUSTRATED cannot be responsible for entries lost or damaged.
4. Contest closes November 30, 1946. Judges are Editors of MECHANIX ILLUSTRATED; their decisions will be final. Duplicate prizes will be awarded in case of a tie. Address Color Photo Editor, MECHANIX ILLUSTRATED, 347 Madison Avenue, New York 17, N. Y.

1st Prize	$100	4th Prize	$25
2nd Prize	75	5th Prize	25
3rd Prize	50	6th Prize	25

No More Test Strips

[*Continued from page* 149]

of cardboard and number each one of the 14 steps of the gray scale along the right hand side, starting at the top with the number corresponding to the light measurement at which the scale was made (15 in the example given above) and continue down using the same series of numbers as those on the guide (2-3-4-6-8-etc.). Note that this series of numbers increases by approximately 50% at each step.

To check the meter dial calibration, keep in mind that the gray scale was made with a fixed light (in this case 15) and exposure time varying in steps from 2 seconds to 3 minutes. If the meter dial is correct, the same gray shades should be obtained with a fixed exposure time and varying light. For instance, in the gray scale you have just made, shade 360 should be obtained from light 360 at 2 seconds.

Make a test piece at this exposure and compare. If the shades do not match, increase or decrease the light as required until you get a test that matches. Number 360 on the dial should then be shifted to that point. In the same way make test pieces for other meter settings and if necessary shift the dial numbers accordingly. With the calibration finished, you can proceed to make gray scales of all your paper grades.

MAKING A PRINT. The enlarger is adjusted as usual, with the negative focused on the easel and the light adjusted to give an estimated satisfactory exposure time. Place the meter on the easel and measure the highlight (darkest part) and the shadow (lightest part). Count the number of gray scale steps that will be included between these measurements. This is the negative range. For a normal, full-scale print, select a paper having the same range as that of the negative. However, this is not always possible, so we usually print for the highlights and lose some detail in the shadows. In this case divide the negative highlight measurement by the first gray number (paper highlight). The result gives the print exposure time. You can measure any part of the negative; dividing by any gray scale number will give the enlarging time which will result in that gray shade for that part of the print.

Tin Can Camera Case

[*Continued from page* 151]

and bottom meet at each end. After the two reenforcing pieces, mentioned before, have been soldered in place, you can proceed to lay out the pattern for the front section, checking the measurements with the completed main body to insure accurate fit.

When the front section has been completed and attached to the main body, the pattern for the lid can be made, checking it with the completed parts in a similar manner.

The lid is attached to the front section by a hinge consisting of five tubes. Three of these tubes are shaped from the tabs cut in the pattern of the lid (see drawing). The other two are made separately out of strips of tin can metal and are soldered near the top of the front section. To insure correct alignment of these two, place the completed lid on the case and hold the two loose tubes in place by inserting the hinge pin through them and through the three hinge tubes attached to the lid. Then solder the loose tubes to the front section, see photo on page 151. The flange on the lid of the case is 7/16 in. wide. If the lid fits snugly, no catch is necessary to hold case shut. FINISH: The completed case was coated with gray automobile enamel. If you haven't any of this handy it can be obtained at many garages and service stations in small bottles of "touch-up" enamel having self-contained brushes. They sell for about 30c and a variety of attractive colors is generally available.

The inside of the main body of the case was left unpainted as were the rings to which the neck cord is attached. The inside of the flange of the lid was not painted nor was the upper part of the case against which this flange rubs when the case is being opened or closed.

A hole was cut in the bottom of the case. This hole is in line with the tripod socket of the camera and permits using the camera on a tripod without removing it from the case. It can also be used to lock the camera in the case by means of a "safety screw" used with this type of ever-ready case. These screws are available at camera stores for about a quarter.

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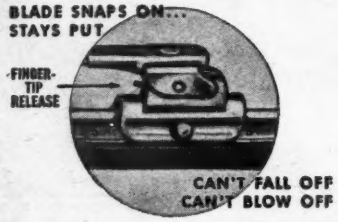

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Ask for RAIN-MASTER Windshield Wiper Arms and Blades next time you buy gas.

THE ANDERSON COMPANY
Established 1918
GARY, INDIANA

Safe Man

[*Continued from page* 103]

lems. Eads is positive no inmate of a penal institution ever has or will be called on such a job. "There is no need to call on crooks on the outside," he says frankly. "There are plenty in the profession itself."

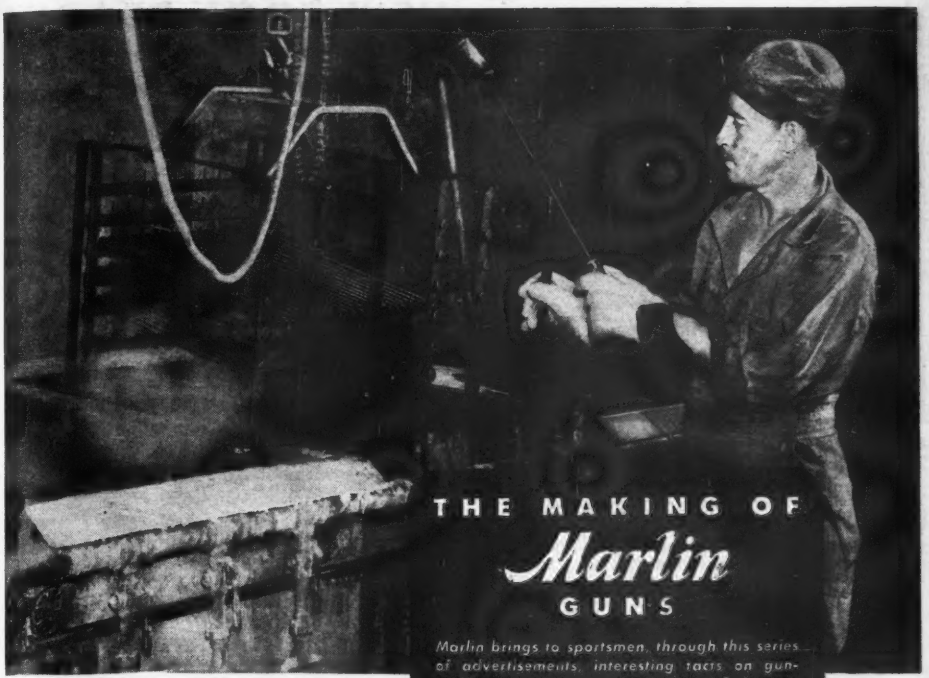
Outlaw locksmiths, fly-by-night operators, do exist, and have been the blight of the locksmithing profession for many years. Licensed master locksmiths are up in arms against them, and at the moment the Locksmiths' Association, to which all legitimate locksmiths belong, is lobbying in the California legislature to have such shady individuals placed outside the law. But the number of such operators is relatively small, Eads says, for no crook has the patience to learn any trade, especially one as complicated and memory-taxing as that of master locksmith.

A couple of years ago he had a call from the Hollywood fire department to unlock a steel warehouse door which would not yield to a battering ram. The building was afire. It contained much valuable stock, and the night watchman was locked inside. Deaf, excited, he would not listen to the firemen's admonition to jump into the net below. Eads picked the lock on the door just before the smoke finished him.

Some women may use a rolling pin, but one with whom Eads had to deal did not need any. She was a circus fat lady, avoirdupois 320, who used to lock up her shrimp of a husband in a wardrobe trunk every time she got mad. Once she lost the key. The husband lost consciousness. Eads was promptly summoned to help. "It was an ordinary Yale lock," he says, "but I felt women like that one should be made to suffer. When she wasn't looking I opened the trunk and whispered to the little fellow to lie very still. He caught on all right. Between the two of us we managed to get her pretty scared. I picked on that lock for half an hour, while she moaned and groaned that her dear, darling husband would surely die."

Movie actors, circus fat ladies, bankers, insurance investigators, police officers, file through Eads' shop in an endless parade. Each thinks his problem is unique and needs immediate attention. Actually most of them run true to well-worn patterns and Eads only has to remember a former case, similar, to solve a new one. Since his mobile locksmith shop—a complete setup in a station wagon—is ready to dash to any emergency 24 hours a day, the oddest cases fall to him. He has seen the town's most important socialites shivering in bare feet and pajamas at the doors of their flames' apartments—most undignifiedly locked out. He has rushed to rescue babies out of locked and burning automobiles right on the busy Hollywood boulevard—or dogs, fainted, left in antiquated coupes without a breath of air under the hot midday sun by their thoughtless owners. "I always personally report those cases to the authorities," Eads says, frowning.

—*Tamara Andreeva.*



Blueing Marlin Barrels in Chemical Reactor

Finishing

Beautifully-grained hardwoods and the sheen of blued steel are a combination to delight the sportsman's eye. Great care, experience and skill go into the finish of fine sporting firearms.

Blueing of steel is a chemical process of five carefully-timed baths—(1) cleaner; (2) hot rinse; (3) chemical reactor; (4) rinse; (5) soluble oil. The blue-black finish which results is rust-resistant, handsome and practical.

Before the blue is applied, external metal parts are polished to a satin finish by expert craftsmen. Skill is at a premium also in the final hand-shaping and polishing of stocks. All-weather lacquer brings out the beauty of grain and color and contributes to long life of the firearm.

• • •

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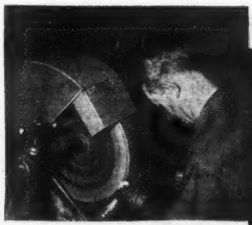

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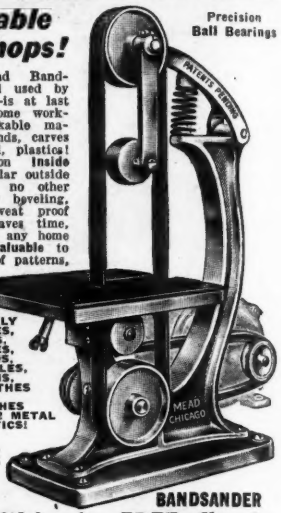
Now Available to Home Shops!



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Laminated Salad Bowl . . . Coasters

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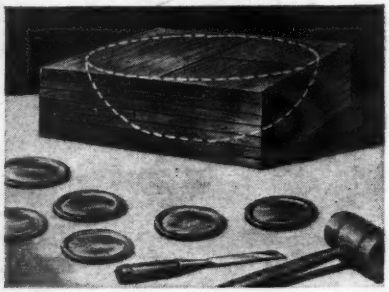

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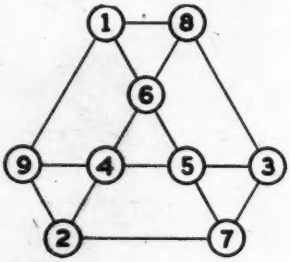
CASCAMITE

Dry Powder Urea Resin Glue

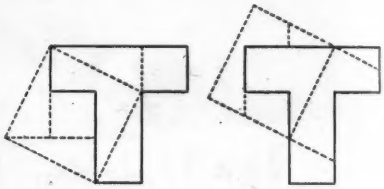
MI brain busters

(See page 76)

1. Solution:



2. Two solutions:



3. A solution:

$$\begin{array}{r} 501 \times 2 = 1002 \\ 43 \times 6 = 258 \\ 98 \times 7 = 686 \\ \hline 1946 \end{array}$$

4. Solution:

N A v i g a t o r	n o n p a r e I L
i N A b i l i t y	r e c o n c I L e
d e N A t u r e d	p r e v a I L e d
s i g N A t u r e	s t e r I L i z e
r e s o N A n c e	v a c I L l a t e
c e n t e N A r y	s t I L l n e s s
a b d o m i N A l	d I L i g e n c e
p h e n o m e N A	I L l u m i n e d

5. Solution: The first circle, alone, will of course have no intersections. The second circle will have two points of intersection, having in two places to cross the first circle. The third circle, having to cross both the first and second circles, will have four points of intersection. (At about this step visualization becomes difficult, so we continue by logical reasoning.) The fourth circle will therefore have six points; the fifth, eight; and the sixth, ten. Total, and answer, 30.

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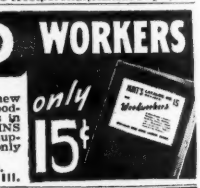

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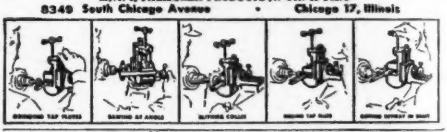

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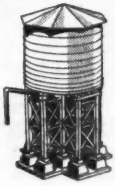

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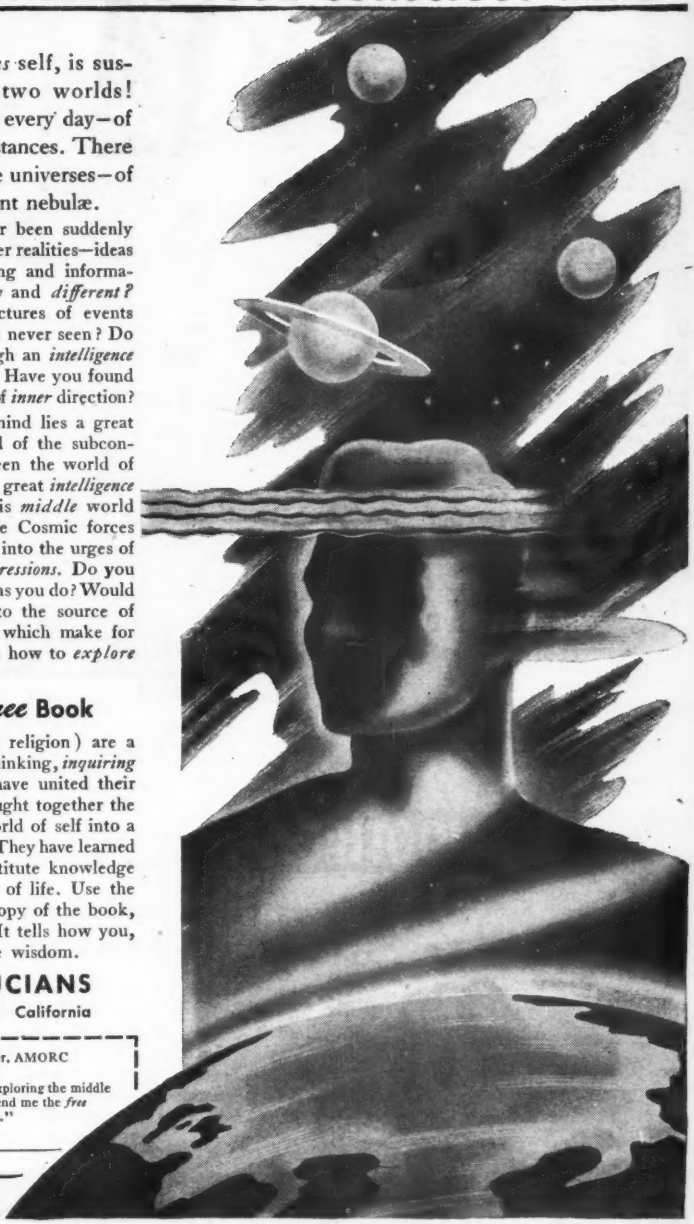

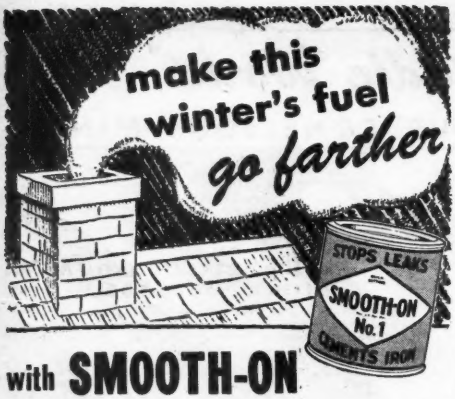

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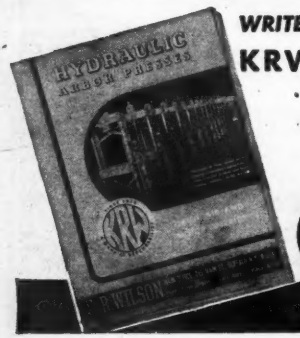

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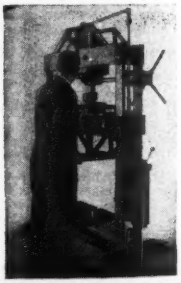

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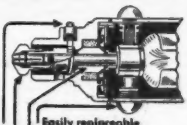

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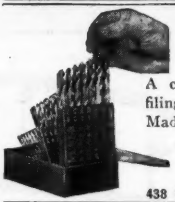

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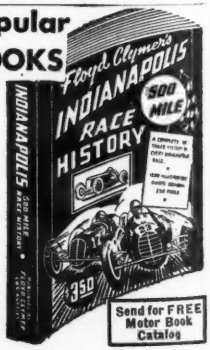

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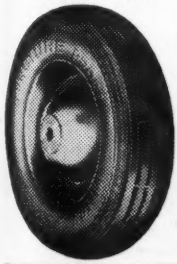

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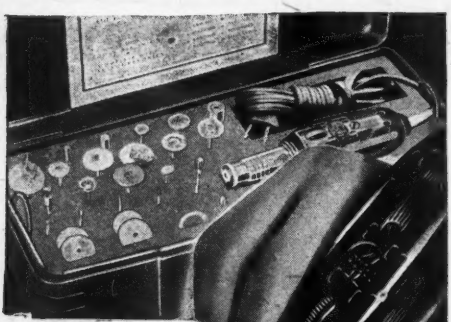

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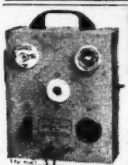

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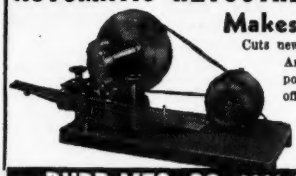

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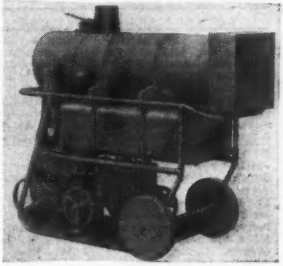

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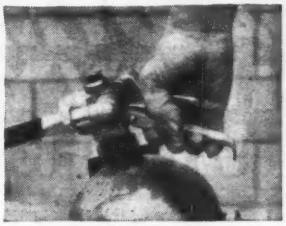

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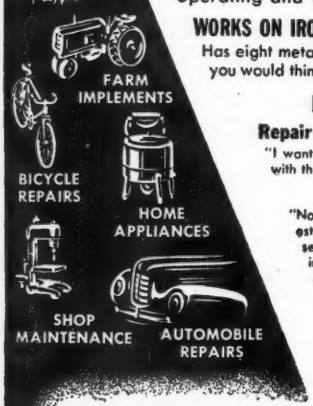

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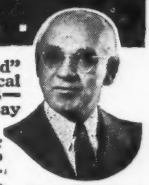

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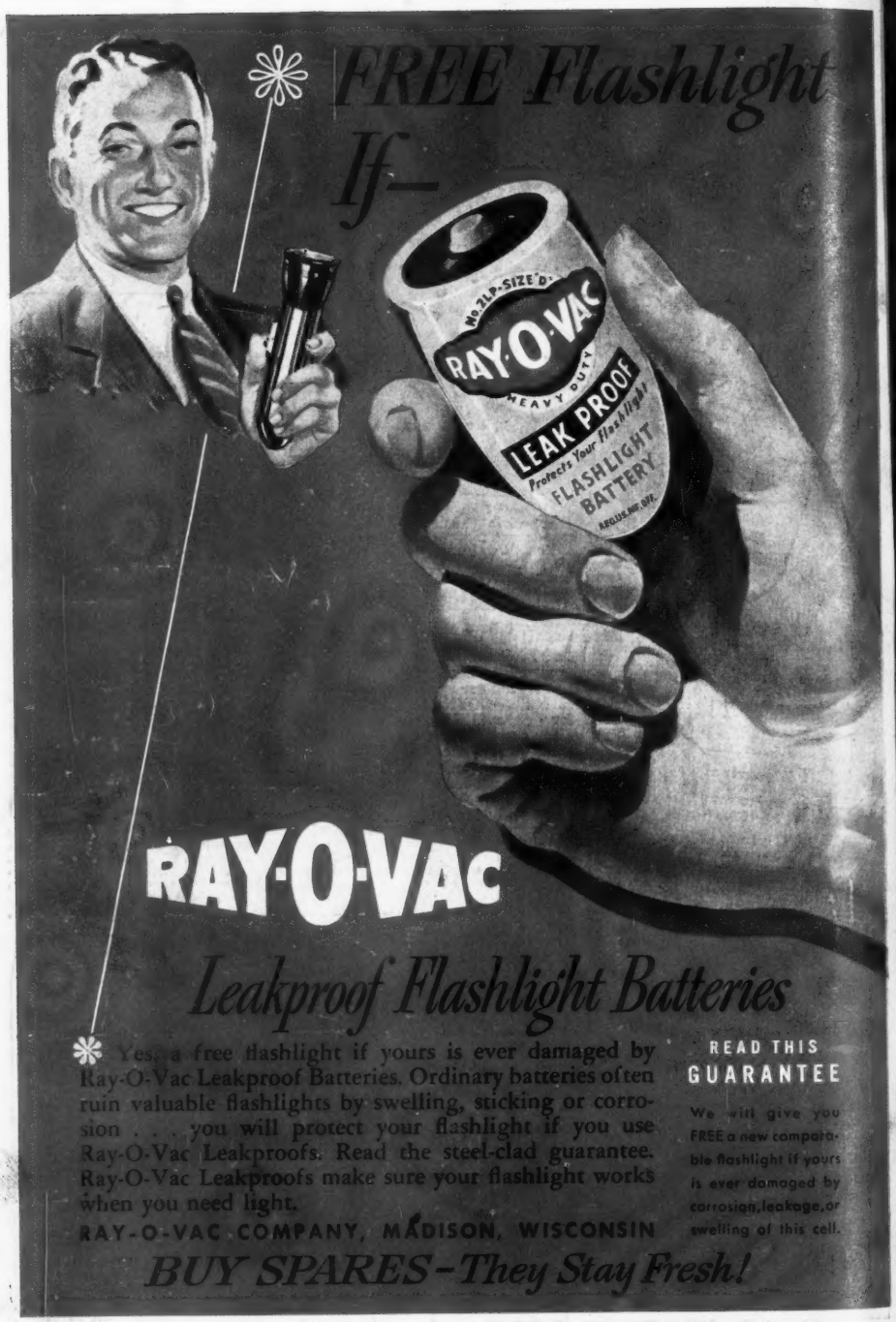
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